USAFOEHL REPORT

88-149EQ0686MEF

COMPLIANCE TESTING OF EIELSON AFB CENTRAL HEATING AND POWER PLANT, COAL FIRED BOILER NO. 3, EIELSON AFB AK

JAMES A. GARRISON, Major, USAF, BSC

December 1988

Final Report

USAF Occupational and Environmental Health Laboratory
Human Systems Division (AFSC)
Brooks Air Force Base, Texas 78235-5501

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The Public Affairs Office has reviewed this report, and it is releasable to the National Technical Information Service, where it will be available to the general public, including foreign nations.

This report has been reviewed and is approved for publication.

James A. Garrison

JAMES A. GARRISON, Maj, USAF, BSC
Chief, Air Quality Function

SHELTON R. BIRCH, Colonel, USAF, BSC
Chief, Consultant Services Division

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James C. Rock

JAMES C. ROCK, Colonel, USAF, BSC
Commander

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Maj James A. Garrison

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19 ABSTRACT (Continue on reverse if necessary and identify by block number)

At the request of HQ AAC/SGPB, compliance testing for particulate and visible emissions was conducted on coal-fired boiler No. 3 in the Eielson AFB Central Heat and Power Plant on 12-22 July 88. The survey was conducted as a requirement for renewal of Alaska Department of Environmental conservation Air Quality Control permit to operate #8331-AA001. Boiler No. 3 was tested at capacities of 100,000 lbs steam/hr and 90,000 lbs steam/hr. Results indicate that boiler No. 3 passed the visible emissions standard, but failed the particulate emission standard.

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CONTENTS

Illustrations

I. INTRODUCTION

On 12-22 Jul 1988, compliance emission testing for particulate and opacity of visible emissions was conducted on coal fired boilers 2 and 3 at the Eielson AFB Central Heating and Power Plant (CH&PP), by the Air Quality Function of the USAF Occupational and Environmental Health Laboratory (USAFOEHL). This survey was requested by HQ AAC/SGPB to determine visible and particulate emission compliance status with regards to the renewal of Alaska Dept. of Environmental Conservation (ADEC) Air Quality Control Permit to Operate No. 8331-AA001. Personnel involved with on-site testing are listed in Appendix A.

II. DISCUSSION

A. Background

On 7 January 1988 Eielson AFB requested that ADEC renew Air Quality Control Permit to Operate No. 8331-AA001 for the CH&PP shown in Figure 1. As a condition of the permit renewal process and prior to issue of the new Air Quality Control Permit to Operate No.

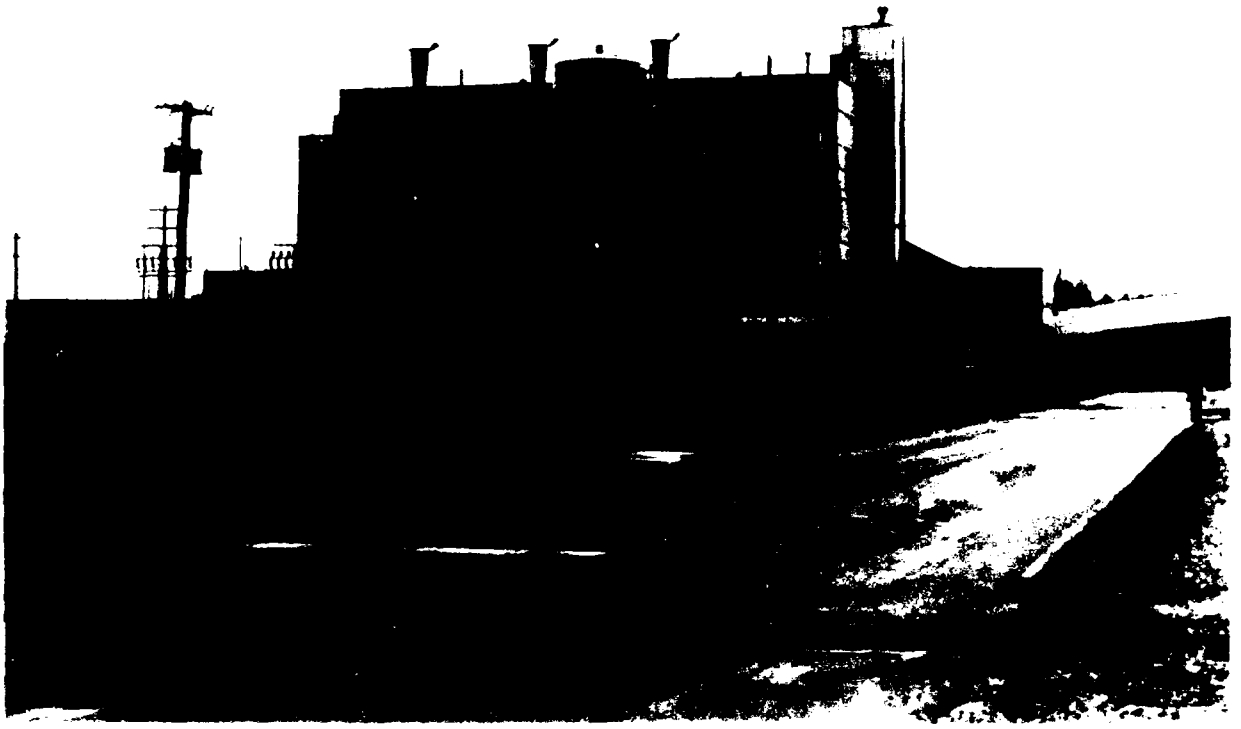

FIGURE 1: EIELSON AFB CENTRAL HEATING AND POWER PLANT

1-AA001 (Appendix B), ADEC required source testing of a representative boiler in accordance with Title 40 Code of Federal Regulations Part 60 (40 CFR 60) Appendix A, Methods 1 through 5 (determination of particulate emissions) and 9 (visual determination of the opacity of emissions) to determine the maximum steam load at which the boilers will meet the applicable emission standards. Permit No. 8831-AA001 limits the operation of the boilers to the maximum steam load at which the associated visible and particulate emissions meet the applicable standards.

To demonstrate and maintain compliance with Alaska Administrative Code, Title 18, Environmental Conservation, Chapter 50 - Air Quality Control (18 AAC 50) and other rules set forth by ADEC, Eielson AFB requested USAFOEHL assistance to: (1) determine particulate emissions from a representative boiler as specified in 40 CFR 60, Appendix A, Reference Methods 1-5, and (2) determine the opacity of visible emissions from the same boiler during Method 5 testing as specified in 40 CFR 60, Appendix A, Reference Method 9.

B. Site Description

The CH&PP operates a total of six boilers for electrical power and steam production:

Boiler No./ Manufacturer	Steam Capacity (lb/hr)	Year Installed	Fuel
1/Springfield Boiler Co.	120,000	1950	coal
2/Springfield Boiler Co.	120,000	1950	coal
3/Springfield Boiler Co.	120,000	1950	coal
4/Springfield Boiler Co.	120,000	1950	coal
5/Garrette and Schafer	120,000	1954	coal
6/Garrette and Schafer	120,000	1954	coal

The CH&PP also operates five steam turbine generators for electrical power production. The turbines range in size from 2500 KW to 10,000 KW. A typical turbine is shown in Figure 2.

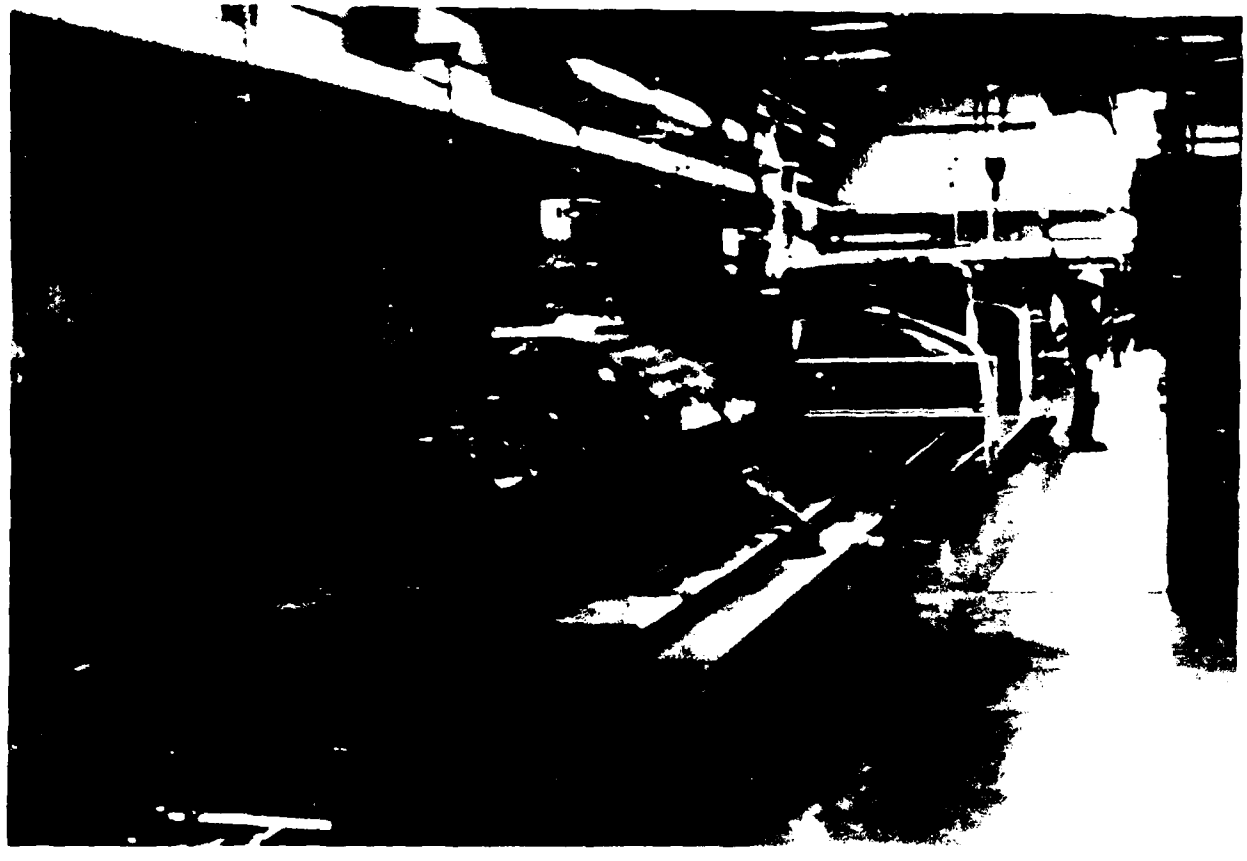

FIGURE 2: STEAM TURBINE GENERATOR

All boilers are spreader-stoker fired units with each having forced-draft and induced-draft fans and mechanical fly-ash collection systems. The purpose of the forced-draft fan is to supply air for combustion and that of the induced-draft fan is to maintain a negative draft condition in the furnace part of the boiler for combustion, removal of gases, and to provide a positive static pressure at flue gas exhaust discharge points. Each unit is fitted with a steam-operated soot blower to remove fly-ash and soot from heat exchanger tubing.

Air pollution control consists of individual multiclone dust collectors on each boiler (Fig. 3). The multiclone dust collectors were manufactured by Western Precipitation Division - Joy Manufacturing Co. and consist of a number of cyclonic collectors operating in parallel. Each unit is located in the boiler exhaust duct upstream of the induced-draft fan.

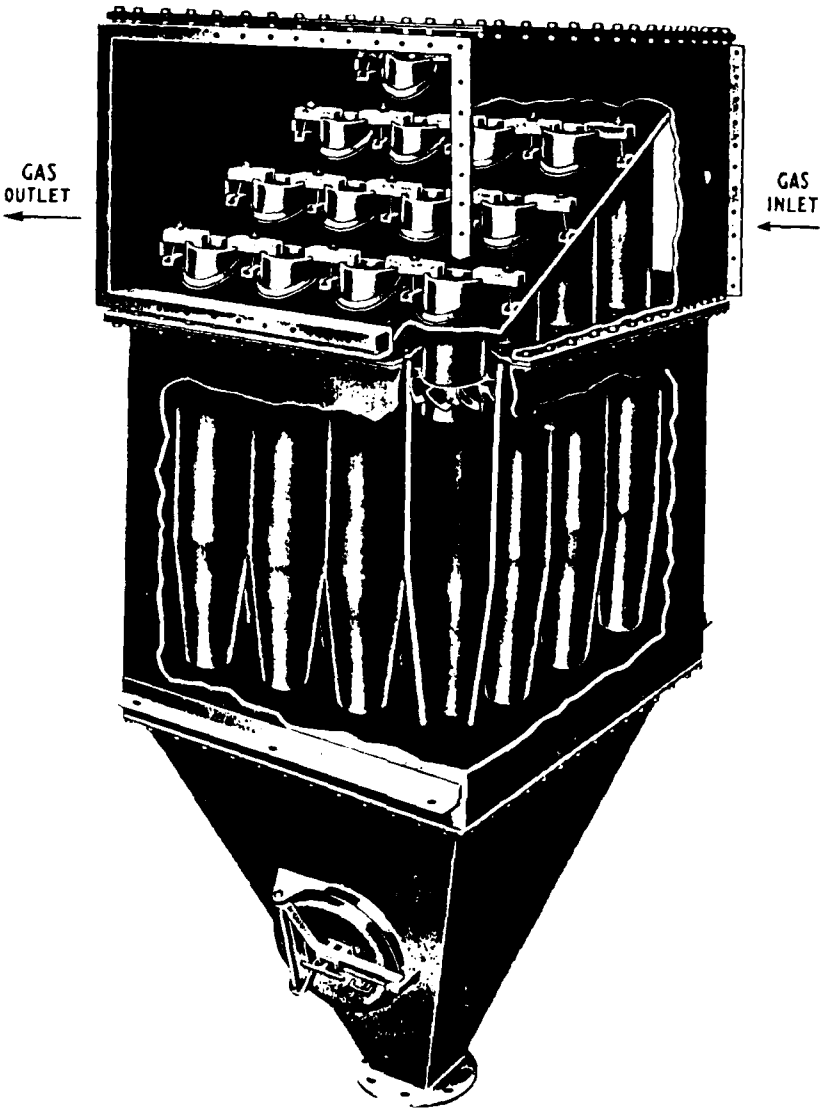

FIGURE 3: MULTICLONE DUST COLLECTOR

The exhaust effluent from each boiler is ducted to a separate exhaust stack located on the roof of the CH&PP. Figure 4 shows the exhaust stack for boiler 1 during testing. All boiler exhaust stacks are similar to the one pictured in Figure 4.

C. Applicable Standards

The opacity, particulate and source testing regulations are defined under 18 AAC 50.050(a), 50.050(b) and 50.500 respectively (Appendix C). Paragraph 50.050(a) states that visible emissions, excluding condensed water vapor from an industrial process or fuel burning equipment, may not reduce visibility through the exhaust effluent by greater than 20% for a total of more than three minutes in any one hour.

FIGURE 4: BOILER STACK DURING TESTING

Under 18 AAC 50.050(b), particulate matter emitted from industrial processes or fuel burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions, 0.1 grains per dry standard cubic foot (gr/dscf) for steam generating plants burning as fuel: (1) coal, and in operation before July 1, 1972 or (2) coal, and rated less than 250 million Btu per hour heat input.

Permit to Operate No. 8831-AA001, Exhibit B, reiterates the visible and particulate emissions standards imposed by 18 ACC 50.050(a) and (b).

D. Sampling Methods and Procedures

The permit to operate for the CH&PP limits the operation of the boilers to the maximum steam load at which the associated visible and particulate emissions meet standards. We analyzed particulate emission data on site to determine the operating capacity which would meet emission standards.

18 AAC 500 and Permit No. 8831-AA001 require that all emissions tests be conducted in accordance with the procedures and analysis methods specified in 40 CFR 60, Appendix A, Methods 1-5 and 9. Therefore, test methods, equipment, sample train preparation, sampling and recovery, calibration requirements and quality assurance were done in accordance with the methods and procedures outlined in 40 CFR 60, Appendix A.

The boiler exhaust stacks are tapered and diverge from a 52 inch (in) outside diameter (OD) at the roof line to a 72 in OD at the top. The included divergent angle of the stack is approximately 7 degrees. The stack height is 14.2 feet (ft). Based on the relative small divergent angle, we considered the stacks to be straight ducts. Sampling ports were already in place and located 38 in above the roof. Prior to the stack, exhaust gases pass through the induced draft fan, rectangular ducting and a transition to the stack located just below the roof (Figure 5). Even though the sampling port location did not meet Method 1 criteria, the ADEC on-scene observer and the test team evaluated the duct system and made the decision to use the existing sample ports. Figure 6 provides a schematic of the exhaust stack and associated duct work. Based on the port location, stack diameter at the sample port location and type of sample (particulate), a maximum number of 24 traverse points were used for emission evaluation.

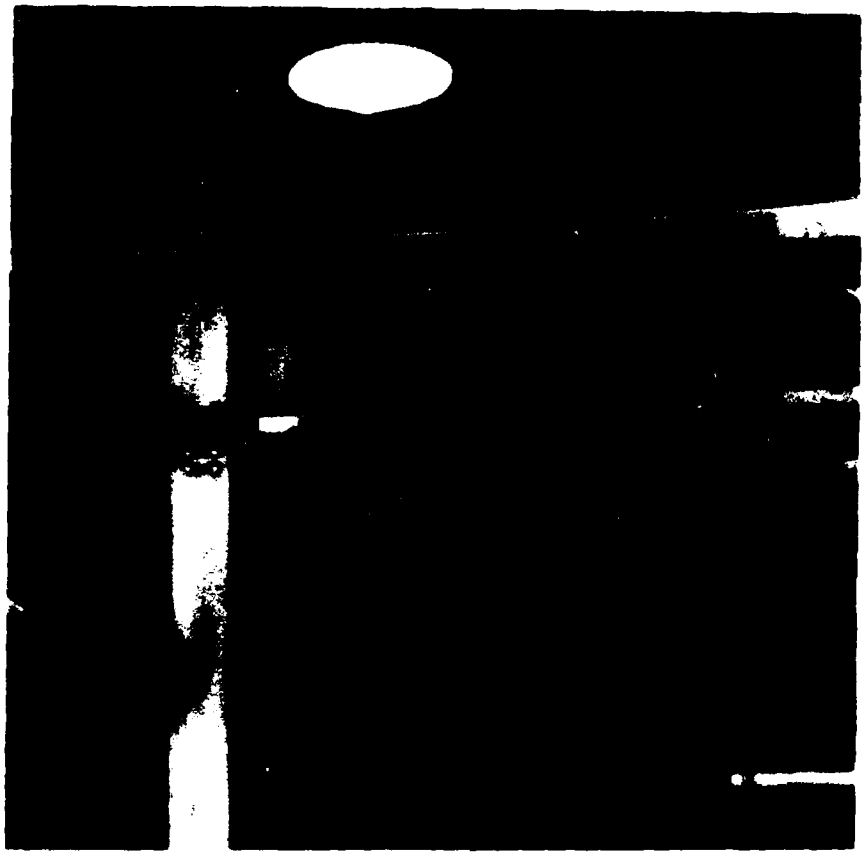

FIGURE 5: EXHAUST DUCT TRANSITION

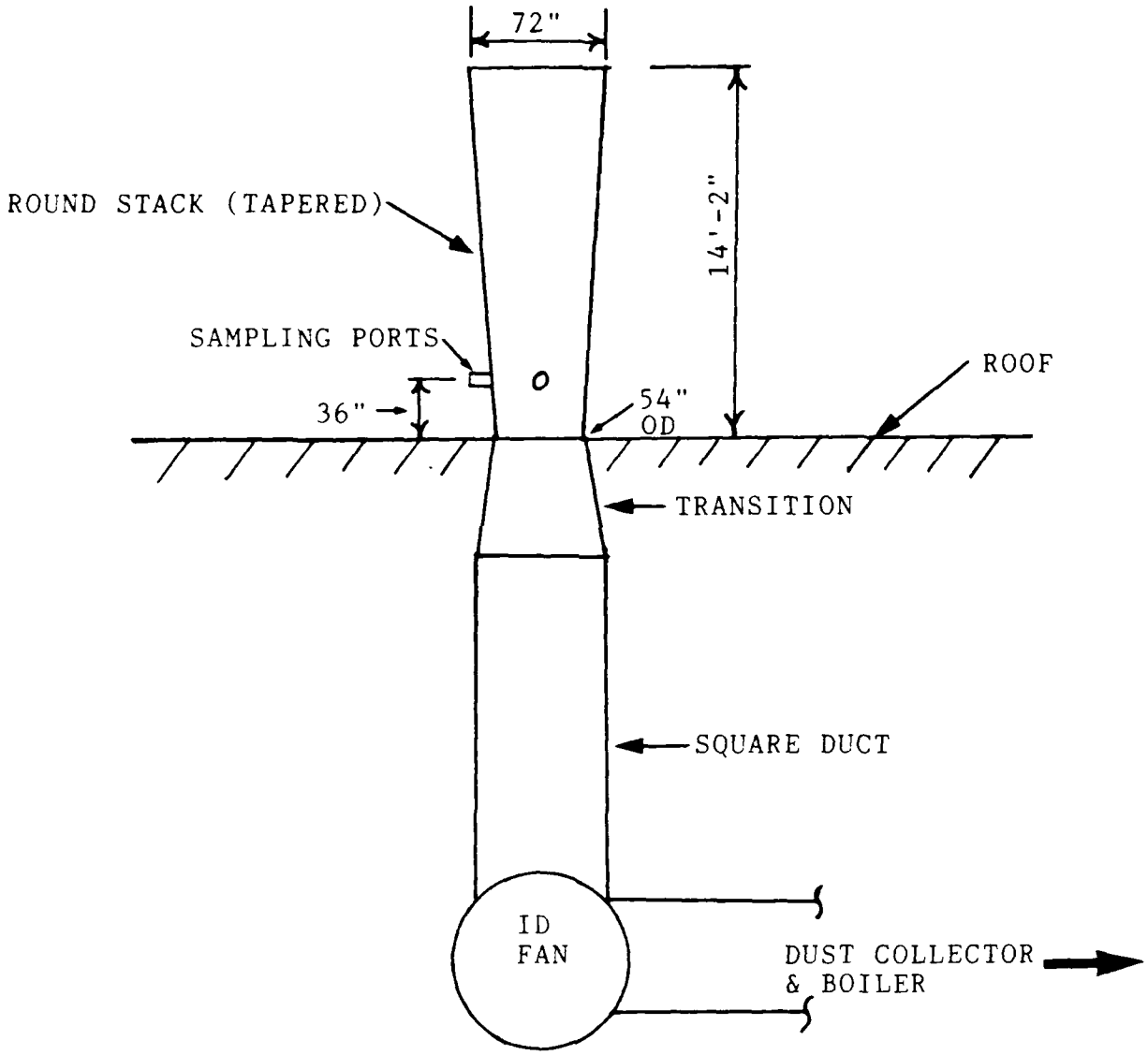

FIGURE 6: EXHAUST STACK DUCT SYSTEM

Particulate samples were collected using the sampling train shown in Figure 7. The train consisted of a button-hook probe nozzle, heated inconel probe, heated glass filter, impingers and pumping and metering device. The nozzle was sized prior to each sample run so that the gas stream could be sampled isokinetically; in other words, the velocity at the nozzle tip was the same as the stack gas velocity at each point sampled. Flue gas velocity pressure was measured at the nozzle tip, using a Type-S pitot tube connected to a ten inch inclined-verticle manometer. Type K thermocouples were used to measure flue gas, as well as, sampling train temperatures. The probe was heated to minimize moisture condensation. The heated filter was used to collect particulate material. The impinger train (first, third and fourth impingers, modified Greenburg-Smith type; second impinger, standard Greenburg-Smith design) was used as a condenser to collect stack gas moisture. The pumping and metering system was used to control and monitor the sample gas flow rate.

The time for each sampling run was 60 minutes; therefore, the sampling time per traverse point was 2.5 minutes. These sample times were applicable for all runs except runs 2 and 3 on boiler 3 during testing at 100,000 lbs steam/hr on 17 July. A smaller nozzle size was used to reduce the total sample volume; however, this resulted in the isokinetic sampling rate being 115.5% and 110.9% for runs 2 and 3 respectively, values greater than the required 100 + 10% range for isokinetic sampling. Even though this would tend to bias the particulate sample low, the emission rates were not affected with regards to compliance. All subsequent runs, including the retest of boiler 3 at 90,000 lbs/hr were within the required isokinetic rate.

Prior to each sample run on a stack, a preliminary velocity pressure traverse was accomplished and cyclonic flow was determined. For acceptable flow conditions to exist in a stack, the average of the absolute value of the flow angle taken at each traverse point must be less than or equal to 20 degrees. The flow angle for the boiler 2 stack averaged 1.3 degrees and that for the boiler 3 stack averaged approximately 1.5 degrees.

During each sample run, a flue gas grab sample for orsat analysis (measures oxygen, and carbon dioxide for stack gas molecular weight determination and emissions correction) was taken. Orsat sampling and analysis equipment are shown in Figures 8 and 9. Flue gas moisture content, also needed for determination of gas molecular weight, was obtained during particulate sampling.

Testing was initially started on boiler 2 at the maximum rated steam output of 120,000 lbs/hr. However, the refractory in the boiler furnace fractured during the second test run of the Method 5 evaluation and testing of this unit was terminated. At the request of the ADEC on-scene observer, the data for the first test run is included in the test report at Appendix E.

Subsequent testing was accomplished on boiler 3 at steam output capacities of 100,000 lbs/hr and 90,000 lbs/hr. Typical boiler operating logs for the 100,000 lbs/hr (17 July) and 90,000 lbs/hr (20 July) test capacities are provided in Appendix D. These logs indicate hourly steam output and other operating parameters. We accomplished two complete Method 5 and Method 9 evaluations of this boiler at each of these operating capacities. One of the three runs which comprised a complete test included a soot blow. This is indicated on the field data sheets provided in Appendixes F-I.

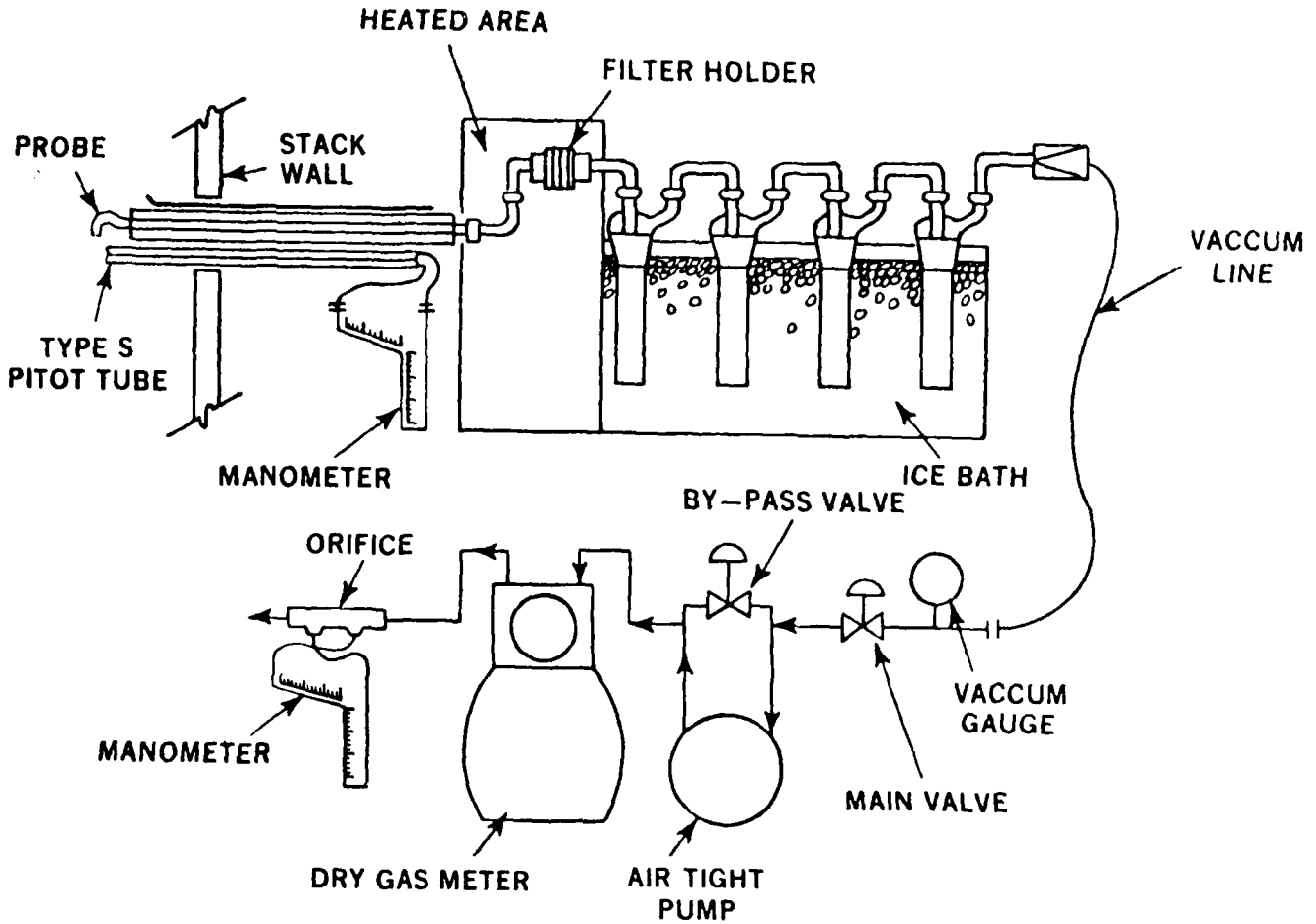

FIGURE 7: PARTICULATE SAMPLING TRAIN

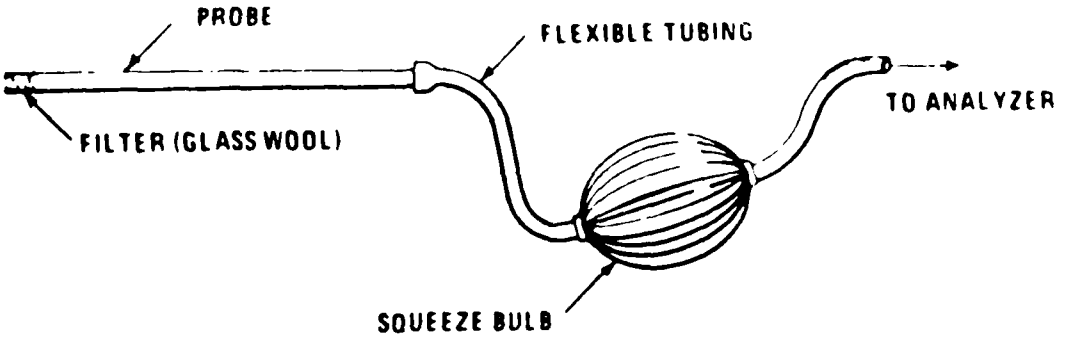

FIGURE 8: ORSAT SAMPLING TRAIN

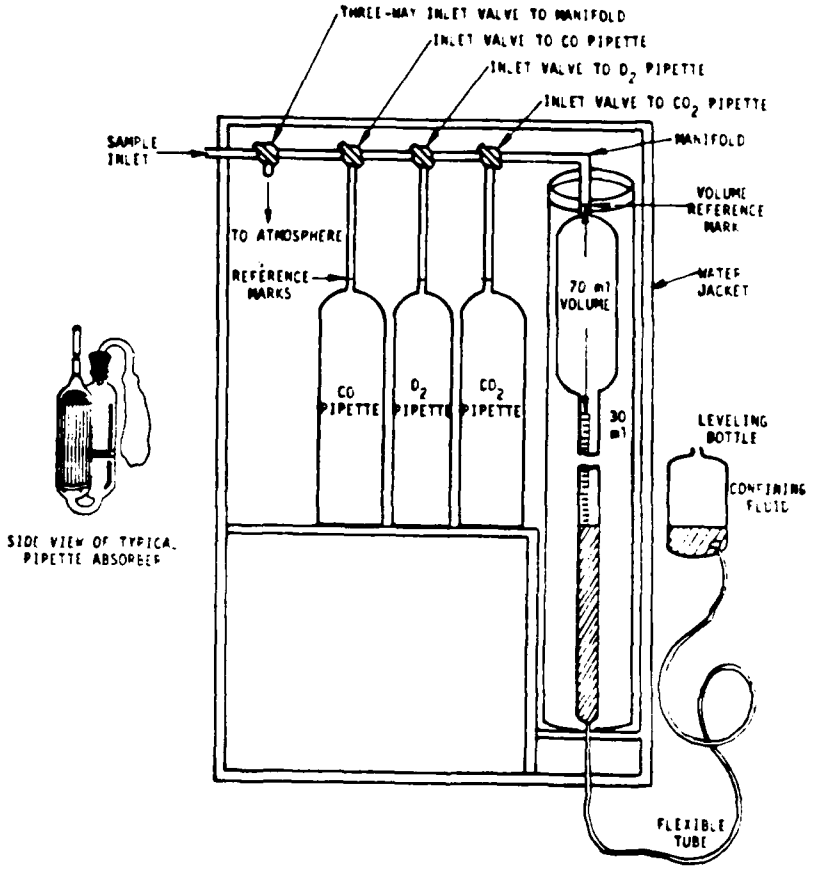

FIGURE 9: ORSAT APPRATUS

Emission calculations were done using "Source Test Calculation and Check Programs for Hewlett-Packard 41 Calculators" (EPA-340/1-85-018) developed by the EPA's Office of Air Quality Planning and Standards, Research Triangle Park NC. This is our standard method for calculating emissions data. Emissions calculations are found in Appendix J. Calibration data are presented in Appendix K.

Method 9 determinations for opacity during this project were accomplished during each test run by a certified test team member. EPA Method 9 certification documentation is provided in Appendix L.

III. CONCLUSIONS

Visible emissions averaged less than 10% for all runs except for time periods where soot blows occurred. Soot blows did cause opacity to exceed 20% but not for more than three-minute period. Visible emission observation forms are provided in Appendices E-I.

Table 1 provides operating parameters for boilers 2 and 3 during testing and the resultant particulate emission rates determined from these tests. Results indicate that the one test run conducted on boiler 2 showed the emissions rate was above the standard of 0.1 gr/dscf. However, this is inconclusive since Method 5 uses the average of the emission rates determined from three test runs as the reportable emission rate. Boiler 3 emissions were above the emission standard for each of the four Method 5 evaluations. Emission rates determined for each test run were above the standard except for run 2 on 20 July when boiler 3 was operating at 90,000 lbs/hr.

We believe that a primary factor in boiler 3 not meeting the emission standard was the physical quality of the coal entering the boiler. The coal should have had an aggregate size of about 3/4 inch; however, the largest aggregate size seen during testing was more on the order 1/4 - 1/2 inch along with a large quantity of very fine material. Coal which most closely matched the desired aggregate size was burned during run 2 of the boiler 3 evaluation on 20 July. As can be seen in Table 1, run 2 was the only test to show an emission rate below the standard.

IV. RECOMMENDATIONS

It is our recommendation that boiler 3 be retested with emphasis on testing with a coal that meets the desirable physical requirements as closely as possible. All aspects of the system (boiler, particulate control devices, etc.) should also be evaluated for proper operation prior to testing.

TABLE 1

STACK EMISSION TEST RESULTS

DATE	BOILER NO.	RUN NO.	BOILER OPERATING CAPACITY (1000 lbs steam/hr)	SOOT BLOW	PARTICULATE EMISSIONS (gr/dscf)*
14 JULY	2	1	120		0.15
17 JULY	3	1	100	X	0.21
17 JULY	3	2	100		0.15
17 JULY	3	3	100		0.14
					AVG = 0.17
18 JULY	3	1	100		0.16
18 JULY	3	2	100		0.14
18 JULY	3	3	100	X	0.29
					AVG = 0.20
19 JULY	3	1	90		0.10
19 JULY	3	2	90	X	0.23
19 JULY	3	3	90		0.11
					AVG = 0.15
20 JULY	3	1	90	X	0.11
20 JULY	3	2	90		0.09
20 JULY	3	3	90		0.13
					AVG = 0.11

* gr/dscf = grains per dry standard cubic foot

REFERENCES

1. "Standards of Performance for New Stationary Sources", Title 40, Part 60, Code of Federal Regulations, July 1, 1987.

2. Quality Assurance Handbook for Air Pollution Measurement Systems - Volume III, Stationary Source Specific Methods, U.S. Environmental Protection Agency, EPA-600/4-77-027-b, Research Triangle Park, North Carolina, December 1984.

3. Source Test Calculation and Check Programs for Hewlett-Packard 41 Calculators. U.S. Environmental Protection Agency, EPA-340/1-85-018, Research Triangle Park, North Carolina, May 1987.

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APPENDIX A

Personnel Information

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1. USAFOEHL Test Team

Maj James Garrison, Chief, Air Quality Function
Capt Tim Fagin, Consultant, Air Quality Engineer
Capt Paul Scott, Consultant, Air Resources Meteorologist
SSGT Dan Schillings, Industrial Hygiene Technician
SGT Robert Davis, Environmental Engineering Technician

USAFOEHL/ECQ
Brooks AFB TX 78235-5501

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Commercial (512) 536-2891

2. Eielson AFB *on-site representatives*

Col Dennis W. Franks	USAF Clinic Eielson/SG
MSGT L.S. Satterrfield	USAF Clinic Eielson/SGPB
SRA Jay L. Dulik	USAF Clinic Eielson/SGPB
Ted W. Tisdale	343 CES/DEMP Utilities Operations General Foreman, Central Heat and Power Plant
George Pousche	343 CES/DEMP Assistant, Utilities Operations General Foreman, Central Heat and Power Plant
Larry Bright	343 CES/DEEV
Jack Coutts	Regional Air Coordinator/Dept of Environmental Conservation, State of Alaska

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APPENDIX B

Permit No. 8831-AA001

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STATE OF ALASKA

DEPT. OF ENVIRONMENTAL CONSERVATION

January 21, 1988

STEVE COWPER, GOVERNOR

(907) 452-1714

Northern Regional Office
1001 Noble Street
Suite 350
Fairbanks, Alaska 99701

CERTIFIED MAIL
RETURN RECEIPT
REQUESTED

Captain George A. Heiner
Chief, Environmental/Contract Planning
U.S. Department of the Air Force
343D Civil Engineer Squad (AAC)
Eielson AFB, Alaska 99702

Dear Capt. Heiner:

Re: Air Quality Control Permit to Operate 8831-AA001

We have received your letter dated January 7, 1988, requesting renewal of Air Quality Control Permit to Operate 8331-AA001. In our review of the permit file, we find a letter dated March 11, 1986 from Capt. Blackshear in which he states "a source test will be conducted after repair. . ." Your letter indicated that the repairs were completed last summer. Since the source test has not been completed, we are requiring it as condition 4 of the new Air Quality Control Permit to Operate # 8831-AA001. Please note that the source test report must be submitted to the department by December 31, 1989. The source test will determine at which maximum load the boiler can be fired.

The new permit expires on January 30, 1993, and you must have it renewed if you intend to continue to operate the facility beyond that date. Please note that there are 11 conditions to be met on this permit. Failure to comply with any of these conditions will result in the suspension or revocation of your permit in accordance with 18 AAC 50.310.

Any person who disagrees with this decision may appeal the decision by requesting an adjudicatory hearing, using the procedures contained in 18 AAC 15.200-310. Hearing requests must be delivered to the Commissioner of the Department of Environmental Conservation, 3220 Hospital Drive, P.O. Box O, Juneau, Alaska 99811-1800, within 30 days of receipt of this letter. If a hearing is not requested within 30 days, the right to appeal is waived and the decision becomes final.

Sincerely,

William D. McGee
Regional Environmental Supervisor

jc/wdm/tss
Enclosure
cc: A. Ewing, EPA/Anchorage
R. Joy, FNSB/Fairbanks
L. Verrelli, ADEC/Juneau
100.16.002

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
NORTHERN REGION OFFICE
1001 NOBLE STREET, SUITE 350
FAIRBANKS, ALASKA 99701

AIR QUALITY CONTROL PERMIT TO OPERATE

Permit No. 8831-AA001 Date of Issue January 21, 1988
Renews Permit No. 8331-AA001

The Department of Environmental Conservation, under the authority of AS 46.03 and 18 AAC 50.400, issues an Air Quality Control Permit to Operate to:

U.S. Department of the Air Force
343D Civil Engineering Squadron (AAC)
Eielson A.F.B., Alaska 99702

FOR THE OPERATION OF the Eielson Air Force Base power and heating plant, consisting of six coal-fired boilers, as described in Exhibit A in accordance with the conditions of this permit and Exhibits A and B and as described in permit application documents listed in Exhibit C.

LOCATED near Fairbanks, Alaska on Eielson Air Force Base.

THE FOLLOWING CONDITIONS SHALL APPLY TO THIS PERMIT:

01. The permittee shall comply with the State Ambient Air Quality Standards established in Section 020 and the applicable emission limitation specified in Section 040 of the State Air Quality Control Regulations 18 AAC 50 and Exhibit B.

02. An Air Contaminant Emission Source Operating Report as described in Exhibit A shall be submitted semiannually to the department's Northern Regional Office, 1001 Noble Street, Suite 350, Fairbanks, Alaska 99701, by the 30th of January and July of each year.

03. The permittee shall maintain and operate all fuel burning equipment, emission control devices, testing equipment, and monitoring equipment to provide optimum fuel burning efficiency during all operating periods. The permittee shall establish and have in the control room written standard operating procedures for use by the operators of the boilers.

04. The permittee shall conduct a source test of one representative boiler in accordance with Title 40 Code of Federal Regulation Part 60 Appendix A, Methods 1 through 5 to determine the maximum steam load at which the boilers will meet the emission standards in Exhibit B. The source

test report must be in the format specified by Appendix IV-3 of the State Air Quality Control Plan and be submitted to the Department's Northern Regional Office by December 31, 1989.

05. Until the source test in Condition 4 is conducted, permittee shall operate the coal fired boilers at a firing rate, which at no time shall exceed 100,000 lbs/hr stream, (5/6) rated capacity, based on one-hour average steam production. The source test shall thereafter determine the maximum load.

06. Additional testing or monitoring, as deemed necessary, shall be conducted, installed, maintained, and operated in accordance with 18 AAC 50.500 and 50.520 to measure air contaminant emission concentrations. If any continuous monitor is malfunctioning or non-operable for three or more consecutive days, permittee shall notify the Northern Regional Office of the department on the fourth day indicating the cause of failure and anticipated time required to repair the instrument.

07. The permittee shall maintain test results, monitoring instrument recording charts, and other applicable data in an active file for not less than one year, and have them accessible, upon request, to the department for not less than three years.

08. Permittee shall notify the department's Northern Regional Office by telephone (452-1714) when equipment failures or operation conditions occur which increase air contaminant emissions. Opacity violations totaling less than one-half hour per day do not need to be reported. The permittee shall report the expected duration, nature of occurrence, amount and type of material burned, and steps taken to minimize emissions and avoid recurrence.

09. Permittee shall submit a written report by the 15th day of each month to the department's Northern Regional Office which summarizes the date, time, and other information requested in Condition 8 for each incident reported in accordance with that permit condition and in violation of performance limitations listed in Exhibit B.

10. The department's representative is allowed access to permittee's facilities to conduct inspections or tests to determine compliance with this permit and state environmental laws and regulations.

11. A copy of this permit shall be clearly displayed, and the State Air Quality Control Regulations 18 AAC 50 kept on file, at the permitted facility location.

This permit expires 30 January 1993 and may be suspended or revoked in accordance with 18 AAC 50.310.

William D. McGee
Regional Environmental Supervisor

EXHIBIT A
AIR QUALITY CONTROL PERMIT TO OPERATE 8831-AA001
AIR EMISSION SOURCE OPERATING REPORT

An Air Source Operating Emission Report shall be submitted to the Alaska Department of Environmental Conservation, Northern Regional Office, 1001 Noble Street, Suite 350, Fairbanks, Alaska 99701 semiannually by January 30 and July 30 each year. The report shall include, but not be limited to, the following information:

1. Facility identification and reporting period. Include the firm name, facility name and location, permit number and the period of time covered by the report.

2. Operating time and fuel consumption logged on permitted equipment tabulated by quarter. Include the number of days or hours of operation and quantity of fuel consumed by each boiler.

3. Report a change in type of fuel and tests or analyses performed.

4. A brief discussion of any change in monitoring equipment or failure which may affect reported results or yield incomplete data for any given day.

5. Signature of authorized agent preceded by the statement, "I am familiar with the information contained in this report and that to the best of my knowledge and belief such information is true, complete, and accurate."

EXHIBIT B
AIR QUALITY CONTROL PERMIT TO OPERATE 8831-AA001
AIR CONTAMINANT EMISSION LIMITATIONS

Exhaust conditions shall be in accordance with the information submitted.

Pollutant	Performance Limitation	Annual Limit TPY
Particulate matter	0.1 grains per dry standard cubic foot, 100,000 lbs steam/hour for each of the 134 MMBTU/HR boilers 20 percent opacity not to be exceeded for more than 3 minutes in any one hour, except during upsets, startups, and shutdowns	150 per each of the six boilers

EXHIBIT C
AIR QUALITY CONTROL PERMIT TO OPERATE 8831-AA001
PERMITTEE'S DOCUMENTATION

1. Department of the Air Force Air Quality Control Permit to Operate application dated December 19, 1977, and emissions information report OMB 158-R75, dated February 2, 1976.

2. The Alaska Department of Environmental Conservation (ADEC) report of "Particulate Matter and Sulfur Dioxide Emissions Source Test" for Eielson Air Force Base's power plant May 14 and 15, 1981.

3. ADEC letter to U.S. Air Force Director, Engineering Energy and Environmental Planning Elmendorf Air Force Base, dated March 19, 1985, requesting a source test at the Eielson power plant.

4. U.S. Air Force letter dated March 11, 1986, to ADEC stating "a source test will be conducted. . ."

5. U.S. Air Force letter dated January 7, 1988, to ADEC requesting renewal of Eielson's Air Quality Control Permit to Operate.

APPENDIX C

State Regulations

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ALASKA AIR QUALITY CONTROL REGULATIONS

(Alaska Administrative Code, Title 18, Environmental Conservation, Chapter 50 — Air Quality Control; Effective May 26, 1972; Amended November 9, 1972; May 8, 1974; May 4, 1980; November 1, 1982; October 30, 1983; June 7, 1987)

ARTICLE 1.
PROGRAM STANDARDS AND LIMITATIONS

50.010. APPLICABILITY OF LOCAL GOVERNMENT REGULATIONS. A local air quality control agency may establish the same or more stringent regulations, but not less stringent regulations, as the applicable regulations specified in this chapter.

50.020. AMBIENT AIR QUALITY STANDARDS. (a) The concentration of contaminants in the ambient air, corrected to standard conditions, may not exceed the following:

(1) suspended particulate matter —

(A) annual geometric mean of 60 micrograms per cubic meter; or

(B) 24-hour average of 150 micrograms per cubic meter more than once each year;

(2) sulfur oxides, measured as sulfur dioxide —

(A) annual arithmetic mean of 80 micrograms per cubic meter;

(B) 24-hour average of 365 micrograms per cubic meter more than once each year; or

(C) three-hour average of 1300 micrograms per cubic meter more than once each year;

(3) carbon monoxide —

(A) eight-hour average of 10 milligrams per cubic meter more than once each year; or

(B) one-hour average of 40 milligrams per cubic meter more than once each year;

(4) ozone — one-hour average of 235 micrograms per cubic meter expected more than once per year;

(5) nitrogen dioxide — annual arithmetic mean of 100 micrograms per cubic meter;

(6) reduced sulfur compounds, expressed as sulfur dioxide — 30-minute average of 50 micrograms per cubic meter more than once each year; and

(7) lead — quarterly arithmetic mean of 1.5 micrograms per cubic meter.

(b) In areas where concentrations of contaminants in the ambient air are less than the standards set out in (a) of this section, the concentrations must be kept below those standards, and no increase above the baseline concentration may exceed

(1) for a Class I area

(A) suspended particulate matter —

(i) annual geometric mean of five micrograms per cubic meter; or

(ii) 24-hour average of 10 micrograms per cubic meter more than once each year; and

(B) sulfur dioxide —

(i) annual arithmetic mean of two micrograms per cubic meter;

(ii) 24-hour average of five micrograms per cubic meter more than once each year; or

(iii) three-hour maximum of 25 micrograms per cubic meter more than once each year;

(2) for a Class II area

(A) particulate matter —

(i) annual geometric mean of 19 micrograms per cubic meter, or

(ii) 24-hour average of 37 micrograms per cubic meter more than once each year; and

(B) sulfur dioxide —

(i) annual arithmetic mean of 20 micrograms per cubic meter;

(ii) 24-hour average of 91 micrograms per cubic meter more than once each year; or

(iii) three-hour average of 512 micrograms per cubic meter more than once each year;

(3) for a Class III area

(A) particulate matter

(i) annual geometric mean of 37 micrograms per cubic meter; or

(ii) 24-hour average of 75 micrograms per cubic meter more than once each year, and

(B) sulfur dioxide

(i) annual arithmetic mean of 40 micrograms per cubic meter;

(ii) 24-hour average of 182 micrograms per cubic meter more than once each year; or

(iii) three-hour average of 700 micrograms per cubic meter more than once each year.

50.021. STATE AIR QUALITY CLASSIFICATIONS. (a) For purposes of classifying areas according to air quality, those areas in nonattainment with the ambient air quality standards of this chapter are

(1) Anchorage urban area for carbon monoxide; and

(2) Fairbanks and North Pole urban areas for carbon monoxide.

(b) For purposes of the ambient air quality standards specified in 18 AAC 50.020(b)

(1) Class I areas in the state are

(A) Denali (Mt. McKinley) National Park;

(B) that portion of Bering Sea National Wildlife Refuge designated as a National Wilderness Area;

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(C) that portion of Simeonof National Wildlife Refuge designated as a National Wilderness Area, and

(D) that portion of Tuxedni National Wildlife Refuge designated as a National Wilderness Area.

(2) those areas of the state not classified in (1) of this section, or (1) or (3) of this subsection are classified as Class II; and

(3) no areas in the state have been classified as Class III.

(c) For purposes of preventing impairment of visibility, the designated areas are

(1) Mt. Deborah and the Alaska Range East, as viewed from approximately the Savage River Campground area,

(2) Mt. McKinley, Alaska Range, and the Interior Lowlands, as viewed from the vicinity of Wonder Lake, and

(3) the Class I areas listed in (b)(1) of this section.

(d) For purposes of maintaining the ambient air quality standards set out in 18 AAC 50.020(a), the Mendenhall Valley of Juneau is a wood smoke control area.

50.030. OPEN BURNING. (a) Open burning must achieve maximum combustion efficiency throughout the burning period, and is subject to the exception in (e) of this section, the limitations in (b), (c), (d), and (f) of this section, and 18 AAC 50.110.

(b) Open burning of asphalts, rubber products, plastics, tars, oils, oily wastes, contaminated oil cleanup materials, or other materials in a way that gives off black smoke is prohibited without written approval from the department. Approved open burning is subject to the following limitations.

(1) controlled fires for training fire fighters must be advertised through news media in the general area of the activity at least three days before the activity, informing the public of the time, place, and purpose of the fire, unless waived by the department;

(2) open burning of liquid hydrocarbons produced during oil or gas well flow tests will be approved only if there are no practical means available to recycle, reuse, or dispose of the fluids in a more environmentally acceptable way, and

(3) reasonable procedures and requirements must be established by the person doing the burning to minimize adverse environment effects and limit the amount of smoke generated.

(c) Open burning or incineration of pesticides, halogenated organic compounds, cyanic compounds, or polyurethane products in a way that gives off toxic or acidic gases or particulate matter is prohibited.

(d) Open burning of putrescible garbage, animal carcasses, or petroleum-based materials is prohibited if it causes odor or black smoke which has an adverse effect on nearby persons or residences.

(e) Controlled burning for the management of forest land, vegetative cover, fisheries, or wildlife habitat, other than burning to combat a natural wildfire, requires written approval from the department.

(f) Open burning is prohibited in an area if an air quality advisory by the department is broadcast on radio or television stating that burning is not permitted in that area for that day. This advisory will be based on a determination that there is or is likely to be inadequate air ventilation to maintain the standards set by 18 AAC 50.020.

(g) Open burning is prohibited in wood smoke control areas identified in 18 AAC 50.021(d) between November 1 and March 31.

50.040. INCINERATORS. (a) Visible emissions, excluding condensed water vapor, from an incinerator may not reduce visibility through the exhaust effluent by

(1) greater than 20 percent for a total of more than three minutes in any one hour, except as provided in (2) of this subsection, or

(2) 20 percent or greater for municipal wastewater treatment plant sludge incinerators.

(b) Emissions of particulate matter from incinerators may not exceed, per cubic foot of exhaust gas corrected to 12 percent CO_2 and standard conditions, and except as specified in (c) of this section

(1) 0.15 grains for incinerators less than 2,000 pounds, but greater than or equal to 1,000 pounds per hour rated capacity; or

(2) 0.08 grains from incinerators of 2,000 pounds per hour rated capacity or larger.

(c) Emissions of particulate matter from municipal wastewater treatment plant sludge incinerators which serve 10,000 or more persons and burn waste containing more than 10 percent wastewater treatment plant sludge by dry weight, may not exceed 0.65 grams per kilogram of dry sludge input.

50.050 INDUSTRIAL PROCESSES AND FUEL BURNING EQUIPMENT. (a) Visible emissions, excluding condensed water vapor, from an industrial process or fuel burning equipment may not reduce visibility through the exhaust effluent by

(1) greater than 20 percent for a total of more than three minutes in any one hour, except as noted in (2) — (8) of this subsection;

(2) greater than 30 percent for more than three minutes in any one hour for fuel burning equipment in operation before November 1, 1982 and using more than 20 percent woodwaste as fuel;

(3) greater than 30 percent for urea prilling towers in operation before July 1, 1972, for a total of more than three minutes in any one hour;

(4) 20 percent or greater for asphalt plants installed or modified after November 1, 1982;

(5) 20 percent or greater for process emissions, other than from pneumatic cleaners, at coal preparation facilities installed or modified after November 1, 1982;

(6) 10 percent or greater for pneumatic cleaners at coal preparation facilities installed or modified after November 1, 1982,

(7) 10 percent or greater for process emissions, other than from kilns, at portland cement plants installed or modified after November 1, 1982, and

(8) 20 percent or greater for kilns at portland cement plants installed or modified after November 1, 1982.

(b) Particulate matter emitted from industrial processes or fuel burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions

(1) 0.05 grains except as provided in (2) — (4) of this subsection, (d) of this section, and 18 AAC 50.060,

(2) 0.1 grains for steam generating plants burning as fuel

(A) coal, and in operation before July 1, 1972,

(B) coal, and rated less than 250 million Btu per hour heat input, or

(C) municipal wastes,

(3) 0.1 grains for an industrial process in operation before July 1, 1972, or

(4) 0.15 grains from fuel burning equipment in operation before November 1, 1982, and using more than 20 percent woodwastes as fuel.

(c) Sulfur compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel burning equipment may not exceed 500 ppm averaged over a period of three hours, except as provided in (d) of this section, and 18 AAC 50.060.

(d) Emissions from a source installed or modified after November 1, 1982 may not exceed

(1) at asphalt plants, 90 milligrams of particulate matter per cubic meter of exhaust gas at standard conditions;

(2) at petroleum refineries

(A) catalytic cracking unit catalyst regenerator

(i) 1.0 kilogram of particulate matter per 1,000 kilograms of coke burnoff;

(ii) 43.0 additional grams of particulate matter per million joules supplemental heat attributable to fuels burned in a catalyst regenerator waste heat boiler; and

(iii) 500 ppm carbon monoxide by volume of exhaust gas,

(B) sulfur recovery plant rated at more than 20 long tons per day

(i) 250 ppm sulfur dioxide at zero percent oxygen on a dry basis; or

(ii) 10 ppm hydrogen sulfide and a total of 300 ppm reduced sulfur compounds, expressed as sulfur dioxide, at zero percent oxygen on a dry basis, if the air contaminants are not oxidized before release to the atmosphere; and

(C) fuel burning equipment, sulfur dioxide averaged over three hours

(i) equal to the concentration of uncontrolled emissions which would result from burning fuel gas containing 230 milligrams hydrogen sulfide per dry standard cubic meter from equipment burning fuel gas,

(ii) a calculated concentration based on the allowable emissions in (i) and (iii) of this subparagraph and the proportion of fuel gas and other fuels to the total fuel burned in fuel burning equipment, or

(iii) 500 ppm from all other fuel burning equipment,

(3) at coal preparation facilities

(A) thermal drying unit, 70 milligrams of particulate matter per cubic meter of exhaust gas at standard conditions, and

(B) pneumatic coal cleaning unit, 40 milligrams of particulate matter per cubic meter of exhaust gas at standard conditions; and

(4) at portland cement plants

(A) clinker cooler, 0.050 kilograms of particulate matter per 1000 kilograms of feed on a dry basis to the kiln; and

(B) kiln, 0.15 kilograms of particulate matter per 1000 kilograms of feed on a dry basis.

(e) Release of materials other than process emissions, products of combustion, or materials introduced to control pollutant emissions from a stack at a source built or modified after November 1, 1982 is prohibited unless approved in writing by the department.

(f) No person may cause or permit bulk materials to be handled, transported, or stored, or engage in an industrial activity or construction project without taking reasonable precautions to prevent particulate matter from becoming airborne.

50.060. PULP MILLS. Average emissions per ton of pulp produced from a sulfite pulp mill may not exceed in any 24-hour period

(1) 20 pounds of sulfur oxides (expressed as sulfur dioxide) from blow pits, washer vents, storage tanks, digester relief systems, and recovery systems, and

(2) two pounds of particulate matter from blow pits, washer vents, storage tanks, digester relief systems, and recovery systems.

50.070. MOTOR VEHICLE EMISSIONS. (a) Emissions from gasoline-powered motor vehicles, excluding condensed water vapor, may not be visible for more than any five consecutive seconds.

(b) Visible emissions from diesel-powered motor vehicles, excluding condensed water vapor, may not result in a reduction of visibility of greater than 40 percent through the exhaust effluent for more than any five consecutive seconds.

50.080. [Repealed]

50.085. WOOD-FIRED HEATING DEVICES. For wood-fired heating devices,

(1) when an air quality alert is issued under 18 AAC 50.610(a)(1)(B) for particulate matter within a specific area, except areas set out in (3) of this section, visible emissions at the point of release to the atmosphere may not reduce visibility through the exhaust effluent by 50 percent or greater for more than 15 minutes in any one hour;

(2) burning in a way that creates black smoke is prohibited; and

(3) for wood smoke control areas identified in 18 AAC 50.021(d)

(A) visible emissions at the point of release to the atmosphere may not reduce visibility through the exhaust effluent by 50 percent or greater for more than 15 minutes in any one hour; and

(B) when an air emergency has been issued under 18 AAC 50.610 (a)(3)(D), no person may operate, permit, or allow the operation of a wood-fired heating device which results in the emission of smoke.

50.090. ICE FOG LIMITATIONS. The department will, in its discretion, require any person proposing to build or operate an industrial process, fuel burning equipment or incinerator in areas of potential ice fog, to obtain a permit to operate and to reduce water emissions.

50.100. MARINE VESSELS. Within three miles of the coastline of Alaska, visible emissions from any marine vessel, excluding condensed water vapor, may not result in a reduction of visibility through the exhaust effluent of greater than

(1) 40 percent for a period or periods aggregating more than three minutes in any one hour, except as provided in (2) of this section, and

(2) 40 percent for a period or periods aggregating more than six minutes in any one hour during initial startup of diesel-driven vessels.

50.110. AIR POLLUTION PROHIBITED. No person may permit any emission which is injurious to human health or welfare, animal or plant life, or property, or which would unreasonably interfere with the enjoyment of life or property.

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50.120 — 50.190. [Repealed]

ARTICLE 2. PERMIT REQUIREMENTS

50.300. PERMIT TO OPERATE. (a) No person may construct, modify, reconstruct, operate, or cause the operation of the following without a permit from the department

(1) a facility containing a source which requires an air contaminant emission control unit or system to comply with emission standards set by 18 AAC 50.040—18 AAC 50.060, and which is

(A) an industrial process with a total design rate, capacity, or throughput greater than five tons per hour and which physically or chemically treats the material, or

(B) fuel-burning equipment with a rating of 50 million Btu per hour or greater;

(2) fuel-burning equipment with a rating of 100 million Btu per hour or more;

(3) an incinerator with a rated capacity of 1,000 pounds per hour or more;

(4) a facility subject to the standards set by 18 AAC 50.040(c), 18 AAC 50.050(a)(5), 18 AAC 50.050(a)(7), or 18 AAC 50.050(d);

(5) a facility

(A) which has allowable emissions of 100 tons per year or more of an air contaminant regulated under the Clean Air Act (P.L. 91-604) as amended August 7, 1977 (P.L. 95-95), is installed after November 1, 1982, and is a

(i) fossil fuel fired steam electric plant of more than 250 million Btu's per hour heat input,

(ii) coal cleaning plant (with thermal dryers),

(iii) kraft pulp mill,

(iv) portland cement plant,

(v) primary zinc smelter,

(vi) iron and steel mill plant,

(vii) primary aluminum ore reduction plant,

(viii) primary copper smelter,

(ix) municipal incinerator capable of charging more than 250 tons of refuse per day,

(x) hydrofluoric, sulfuric, or nitric acid plant,

(xi) petroleum refinery,

(xii) lime plant,

(xiii) phosphate rock processing plant,

(xiv) coke oven battery,

(xv) sulfur recovery plant,

(xvi) carbon black plant (furnace process),

(xvii) primary lead smelter,

(xviii) fuel conversion plant,

(xix) sintering plant,

(xx) secondary metal production plant,

(xxi) chemical process plant;

(xxii) fossil fuel boiler or a combination of boilers totaling more than 250 million Btu's per hour heat input,

(xxiii) petroleum storage and transfer unit with a total storage capacity exceeding 300,000 barrels,

(xxiv) taconite ore processing plant;

(xxv) glass fiber processing plant; or

(xxvi) charcoal production plant;

(B) which is listed in (A) of this paragraph with allowable emissions of less than 100 tons per year of a regulated air contaminant and is modified after August 7, 1977, causing an increase in allowable emissions of 100 tons per year or more; or

(C) which is listed in (A) of this paragraph with allowable emissions of greater than 100 tons per year of a regulated air contaminant and is modified after August 7, 1980, or after the date of the most recent permit issued for the affected area under 18 AAC 50.400(c)(3), causing an increase in actual emissions equal to or exceeding the emissions listed in (6)(C)(i) — (xvii) of this subsection;

(6) a facility not listed in (5) of this subsection

(A) which has allowable emissions of 250 tons per year or more of an air contaminant regulated under the Clean Air Act (P.L. 91-604) as amended August 7, 1977 (P.L. 95-95), and is installed after November 1, 1982,

(B) which has allowable emissions of less than 250 tons per year of a regulated air contaminant and is modified after August 7, 1977, causing an increase in allowable emissions of 250 tons per year or more, or

(C) which has allowable emissions of more than 250 tons per year of a regulated air contaminant and is modified after August 7, 1980, or after the date of the most recent permit issued for the affected area under 18 AAC 50.400(c)(3), causing an increase in actual emissions equal to exceeding any of the following:

(i) carbon monoxide — 100 tpy;

(ii) nitrogen oxides — 40 tpy;

(iii) sulfur dioxide — 40 tpy,

(iv) particulate matter — 25 tpy;

(v) ozone — 40 tpy of volatile organic compounds as an ozone indicator;

(vi) lead — 0.6 tpy;

(vii) asbestos — 0.007 tpy;

(viii) beryllium — 0.0004 tpy;

(ix) mercury — 0.1 tpy,

(x) vinyl chloride — 1 tpy;

(xi) fluorides — 3 tpy;

(xii) sulfuric acid mist — 7 tpy;

(xiii) hydrogen sulfide (H_2S) — 10 tpy;

(xiv) total reduced sulfur including H_2S — 10 tpy;

(xv) reduced sulfur compounds including H_2S — 10 tpy;

(xvi) increased emissions of a pollutant regulated by the Clean Air Act (PL 91-604) as amended August 7, 1977 (PL 95-95) and not listed in (6)(C)(i)-(xv) of this subsection, or

(xvii) notwithstanding (i) through (xvi), if located within 10 kilometers of an area listed in 18 AAC 50.021(b)(1) with increased emissions that impact the area by 1 ug/m³ or more for a 24-hour average;

(7) a source or facility installed, reconstructed, or modified after July 1, 1979 or after the date of the most recent permit issued since November 1, 1982, under 18 AAC 50.400(c)(4), located within an area identified in 18 AAC 50.021(a), and causing an increase in actual or allowable carbon monoxide emissions, whichever is greater, from the source or facility of 100 tons per year or more; or

(8) a facility or modification to a facility for which the owner or operator has requested that the department approve limitations of emission rates or operations to reduce emissions to levels below those specified in this chapter.

(b) An application for a permit required by (a) of this section must include

(1) one set of plans and specifications clearly showing the layout of the proposed facility, location of individual equipment and points of discharge, building dimensions, and stack heights;

(2) a map or aerial photograph, on a scale at least one inch to one mile indicating the location of the proposed facility, homes, buildings, roads, and other adjacent facilities, and the general topography within 15 kilometers of the facility;

(3) an engineering report outlining the proposed methods of operation, the

amount of material to be processed, the proposed use and distribution of the processed material, and a process flow diagram with description showing points of emission and estimated amounts and types of air contaminants to be emitted;

(4) a description of air quality control devices, including efficiency and other design criteria, and assurances that this equipment is capable of complying with applicable emission requirements specified in this chapter;

(5) if requested by the department, an evaluation of the effect of the facility's expected maximum emissions on the ambient air, including ambient air quality and meteorological data;

(6) if requested by the department, plans for emission reduction procedures to be used during an air episode; and

(7) a detailed schedule for construction or modification of the facility.

(c) A permit application for a facility subject to (a)(5) or (a)(6) of this section must include the following information in addition to that required under (b) of this section:

(1) ambient air and meteorological data to fully describe the air quality in the vicinity of the proposed facility and any changes in air quality due to general growth which has occurred after the establishment of the baseline date in the area the facility or modification would affect; department approval of the air monitoring network is required before starting data collection;

(2) a detailed demonstration that the expected maximum emissions from the construction and operation of the facility, including emissions from associated growth, will not cause a violation, or contribute to an existing violation, of the ambient air quality standards in 18 AAC 50.020(a) or allowable increments in 18 AAC 50.020(b);

(3) an adequate demonstration that the proposed emission control system represents the best available control technology for each air contaminant and for each new or modified source; and

(4) an analysis of the impact of expected maximum emissions from the facility, including emissions from associated growth, on visibility, vegetation, and soils.

(d) A permit application for a facility subject to (a)(7) of this section must include the following information in addition to that required under (b) of this section:

(1) proof that emissions of a pollutant for which the area is declared in nonattainment will not exceed the applicable emission allowance, and will be controlled to a rate which represents the lowest achievable emission rate; and

(2) proof that other sources owned or operated by the applicant within the state are in compliance with the requirements of this chapter and the Clean Air Act (P.L. 91-604) as amended August 7, 1977 (P.L. 95-95).

(e) A permit application submitted under (a)(8) of this section need not include the information required under (b) and (c) of this section, but must specify the limitations on emission rates or operations necessary to exempt the facility from 18 AAC 50.300(a)(5) — (7) or any other requirement of this chapter.

(f) If a permit application is deficient, the department will notify the applicant by certified mail within 30 days after receipt of the application, identifying the deficiencies and the information to be submitted. When the deficiencies are corrected, the department will continue processing the application.

50.310. REVOCATION OR SUSPENSION OF PERMIT. A permit to operate will, in the department's discretion, be revoked or suspended if the conditions of the permit or applicable laws or regulations are violated.

ARTICLE 3. PERMIT REVIEW CRITERIA

50.400. APPLICATION REVIEW AND ISSUANCE OF PERMIT TO OPERATE. (a) Before review under (b) of this section for a facility described in 18 AAC 50.300(a)(5), (6), or (7); for a facility with a stack described in 18 AAC 50.900(23)(C); or for any other facility for which the department finds that additional public review and comment is desirable, an opportunity for public comment and hearing will be provided using the following procedures:

(1) at least 30 days before beginning review under (b) of this section, a summary of the department's preliminary review and analysis of the application will be published in a newspaper of general circulation within the area where the new or modified facility is to be located. The analysis will be sent to the Environmental Protection Agency, and any federal land manager, Indian governing body on a reservation, or unit of local government which may be affected by emissions from the proposed activity; materials submitted by the applicant and a copy of the proposed permit will be available in at least one location within the area of the new or modified facility;

(2) the department, upon its own motion, or upon request, will hold a public hearing on the application following the procedures set out in 18 AAC 15.060(d) —(g); 60 days notice of a hearing will be sent to any affected federal land manager under 18 AAC 50.021(c); and

(3) public comments and testimony received on the application will be evaluated as part of the information needed to complete evaluation of the permit application, and will be made available to the public.

(b) The department will review a permit application and will, in its discretion, issue the permit within 30 days after receipt of all information needed to complete evaluation of the application, including testimony at a public hearing held under (a) of this section. For applications subject to (a) of this section, a copy of the final determination will be published and distributed as described in (a)(1) of this section.

(c) The department will issue a permit only if the applicant shows that:

(1) allowable emissions from the facility and from associated growth will not prevent or interfere with the attainment or maintenance of ambient air quality standards set by 18 AAC 50.020(a);

(2) air contaminant emissions from a source in the facility will not exceed the requirements of 18 AAC 50.040 — 18 AAC 50.060 and 18 AAC 50.110 and are approvable by the Environmental Protec-

tion Agency under the federal new source performance standards or emission standards for hazardous air pollutants;

(3) for a facility subject to 18 AAC 50.300(a)(5) or (6),

(A) the best available control technology for controlling emissions of each pollutant will be installed and used for each new or modified source;

(B) in an area designated in 18 AAC 50.021(b) as in attainment with ambient air quality standards set by 18 AAC 50.020(a), allowable emissions from the facility and from associated growth will not

(i) cause or contribute to an increase in air contaminants greater than specified in 18 AAC 50.020(b), or

(ii) cause an increase of carbon monoxide more than 500 ug/m³ eight-hour average or 2000 ug/m³ one-hour average within any area specified in 18 AAC 50.021(a), and

(C) allowable emissions from the facility and from associated growth will not adversely affect air quality related values, including noise, odor, visibility, vegetation, and soils of any area within the state; and

(4) for a facility subject to 18 AAC 50.300(a)(7),

(A) emissions will not exceed the emission allowance in the applicable nonattainment area;

(B) the lowest achievable emission rate will be achieved for each new or modified source; and

(C) other sources owned or operated by the applicant within the state are in compliance with requirements of this chapter and the Clean Air Act (P.L. 91-604) as amended August 7, 1977 (P.L. 95-95).

(d) A permit to operate

(1) will be granted for no more than five years, after which the permit must be renewed for continued operation of the facility;

(2) will include a compliance schedule if the facility is emitting air contaminants in excess of applicable limitations contained in this chapter, based on the minimum time necessary to install the required control equipment; a permit which includes a compliance schedule must be renewed every year of its duration;

(3) will, in the department's discretion, require the permittee to install, use, and maintain monitoring equipment, to sample emissions according to methods prescribed by the department, at locations and intervals and by procedures specified by the department, to provide source test reports, to provide monitoring data, emission data, and information from analyses of any test samples, and to make periodic reports on process operations and emissions;

(4) will, for an application submitted under 18 AAC 50.300(a)(8), include specific limitations on emissions or operations as necessary to exempt the facility from 18 AAC 50.300(a)(5) — (7) or any other requirement of this chapter;

(5) will, in the department's discretion, require that specific emission reduction procedures be taken during an air episode; and

(6) may not be transferred without the written consent of the regional supervisor.

(e) If an application for a permit is denied, the department will notify the applicant by certified mail, stating the reasons for denial. The notification will include a statement that a person aggrieved by the department's decision may request an adjudicatory hearing within 30 days after service of the denial under 18 AAC 15.200 — 18 AAC 15.310. For applications subject to (a) of this section, a copy of the final determination will be published and distributed as described in (a)(1) of this section.

50.410. [Repealed]

ARTICLE 4. REGULATION COMPLIANCE CRITERIA

50.500. SOURCE TESTING. (a) Except as provided in (d) of this section, the department will, in its discretion, conduct or have conducted air contaminant emission tests to determine compliance with this chapter.

(b) Testing to determine compliance with this chapter must be by methods approved by the department and done at a point or points which characterize the actual discharge into the ambient air.

(c) Except as provided in (d) of this section, air contaminant emission tests must be done at maximum rate burning or operating capacity of the unit, or other rate determined by the department to characterize the actual discharge into the ambient air.

(d) Demonstration by source testing of compliance with the requirements of 18 AAC 50.040(a)(2) and (b)(2) for incinerators greater than 4,100 pounds per hour, 18 AAC 50.050(a)(1) for catalyst cracking unit catalyst regenerators, 18 AAC 50.040(c), 18 AAC 50.050(a)(4) — (8) and (d) must be done at maximum operating or production rates within 180 days after startup of a new or modified source. Source test methods specified in 40 CFR 60, Appendix A, as amended through November 1, 1982 or their equivalent are to be used as follows:

(1) for emissions of particulate matter, procedures specified in reference methods 1, 2, 3, 4, and 5;

(2) for emission of carbon monoxide, procedures specified in reference method 10;

(3) for emissions of sulfur dioxide, procedures specified in reference methods 1, 2, and 6;

(4) for emissions of reduced sulfur compounds, procedures specified in reference method 15;

(5) for hydrogen sulfide content of process fuel gas streams, procedures specified in reference method 11; and

(6) for visible emissions, procedures specified in reference method 9.

(e) If the provisions in (d) of this section do not apply, then compliance with emission standards must be measured by the following.

(1) for emissions of particulate matter, procedures specified in reference methods 1, 2, 3, 4, and 5 of Appendix A to 40 C.F.R. sec. 60 as amended through November 1, 1983;

(2) for emissions of sulfur dioxide, procedures specified in reference methods 1, 2, and 6 of Appendix A to 40 C.F.R. sec 60 as amended through November 1, 1983, and

(3) to determine the reduction of visibility and opacity of exhaust gases, the procedures specified in the department document entitled "Alaska Air Quality Visible Emissions Evaluation Procedures" (dated August 1983).

(f) To determine compliance with this chapter, standard exhaust gas volumes

must include only the gases formed from theoretical combustion of the fuel, plus the excess gas volume normal for the specific source type, corrected to standard conditions.

50.510. AMBIENT ANALYSIS METHODS. (a) Air quality data and analyses submitted in support of a permit application under 18 AAC 50.300(a)(5) or (6) must comply with procedures set out in the department document entitled "ADEC Ambient Analysis Procedures" (dated July 1982).

(b) Continuous ambient air monitoring is required in support of a permit application submitted under 18 AAC 50.300(a)(5) or (6) for each pollutant which exceeds the limitations described in 18 AAC 50.300(a)(6)(C)(i) — (xvii) unless the existing concentrations or the predicted ambient air quality impacts are less than

(1) carbon monoxide — 575 ug/m³, 8-hour average;

(2) nitrogen dioxide — 14 ug/m³, annual average;

(3) total suspended particulates — 10 ug/m³, 24-hour average;

(4) sulfur dioxide — 13 ug/m³, 24-hour average;

(5) ozone —any increase in allowable or actual volatile organic compounds emissions of 100 tons per year or more;

(6) lead — 0.1 ug/m³, quarterly average;

(7) mercury — 0.25 ug/m³, 24-hour average;

(8) beryllium — 0.001 ug/m³, 24-hour average;

(9) fluorides — 0.25 ug/m³, 24-hour average;

(10) vinyl chloride — 15 ug/m³, 24-hour average; and

(11) hydrogen sulfide — 0.2 ug/m³, 1-hour average.

50.520. EMISSION AND AMBIENT MONITORING. (a) Operators of facilities requiring a permit under 18 AAC 50.300 shall install, maintain, and operate continuous ambient air quality, meteorological, process, or emission monitoring and recording devices specified by the department and in accordance with 40 CFR sec. 58, Appendix B, as amended through November 1, 1983.

(b) Operators of facilities subject to 18 AAC 50.040(b)(2), 18 AAC 50.040(c), or 18 AAC 50.050(d) shall install, maintain, and operate continuous emission and process monitoring devices, keep records, and report excess emissions in accordance with procedures established in 40 CFR sec. 60 as amended through November 1, 1983.

(c) The department will, in its discretion, require the owner or operator of an air contaminant source to keep records and periodically report on the nature and amount of emissions as necessary to determine compliance with this chapter.

50.530. CIRCUMVENTION. (a) Use of air for dilution of emission contaminants without causing a total decrease in the contaminants is not permitted as a method of compliance with this chapter, except that dilution air may be used at sulfur recovery plants with a maximum production rate of 20 long tons per day or less to achieve compliance with the 500 ppm sulfur dioxide requirement in 18 AAC 50.050(c).

(b) A person owning or operating a facility emitting air contaminants subject to the limitations and provisions of this chapter shall ensure that the facility is in compliance with this chapter and any other applicable local, state, or federal law.

(c) Stack heights which exceed good engineering practice, or dispersion techniques, may not be used to affect the degree of emission limitation required for control of air contaminants.

(d) No person may construct, operate, or modify an air contaminant emission source which will result in a violation of the applicable emission standards or will interfere with the attainment or maintenance of the ambient air standards of this chapter.

ARTICLE 5. PROCEDURAL AND ADMINISTRATIVE

50.600. RECLASSIFICATION PROCEDURES AND CRITERIA. (a) The department will, in its discretion, periodically review and revise the air quality classifications within the state after notice and public hearing, except that

(1) the areas identified in 18 AAC 50.021(b)(1) of this chapter will not be reclassified; and

(2) the following areas may be reclassified only to Class I or II;

(A) an area which exceeds 10,000 acres in size and is a national monument, national primitive area, national preserve, national recreation area, national wild and scenic river, national wildlife refuge or range, or national lakeshore or seashore; and

(B) a national park or national wilderness area established after August 7, 1977 which exceeds 10,000 acres; and

(3) land within the exterior boundaries of reservations of federally recognized Indian tribes may be redesignated only by the appropriate Indian governing body.

(b) Reclassification will be initiated by the department on its own motion, or upon receipt of a petition for reclassification containing

(1) detailed reasons why reclassification is requested and is in the best interests of the public;

(2) an accurate description of the proposed boundaries of the area and the air quality within it;

(3) a detailed evaluation of emission and ambient air quality effects of any proposed new or modified facility;

(4) an evaluation of the effects of any proposed new or modified facility on air quality within other areas classified under 18 AAC 50.021;

(5) a detailed analysis of the health, environmental, economic, social, and energy effects of the proposed reclassification; and

(6) if an area proposed for reclassification includes or is part of a local government jurisdiction

(A) a resolution recommending reclassification and adopted by each affected unit of local government; and

(B) evidence that the resolution required under (A) of this paragraph was adopted after public hearing with at least 15 days' prior notice published in a newspaper of general circulation.

(c) The department will review the petition for reclassification within 30 days after receipt and will accept it for consideration if it satisfactorily describes the circumstances behind the proposed reclassification and meets the requirements of

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APPENDIX D

Plant Operating Data

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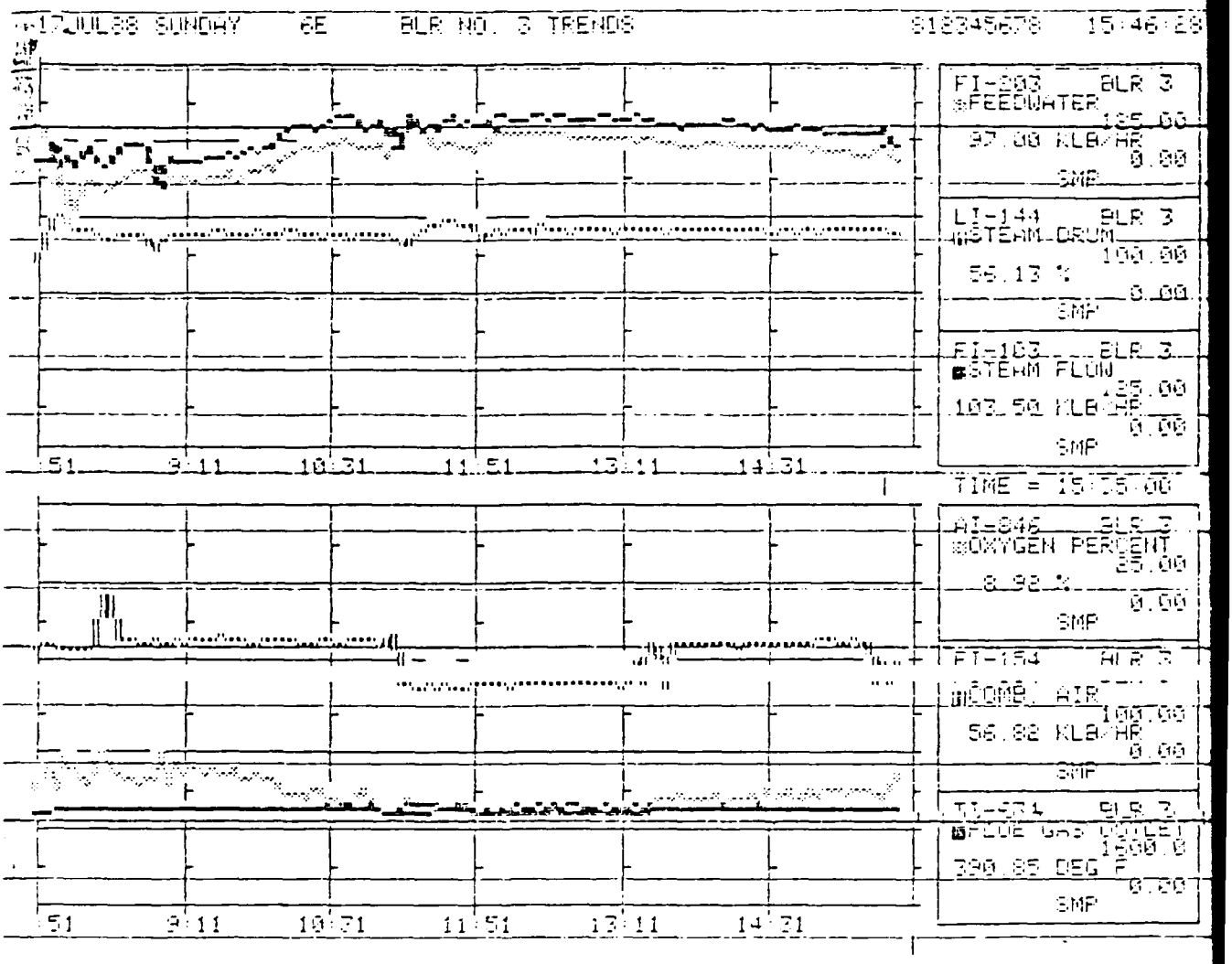
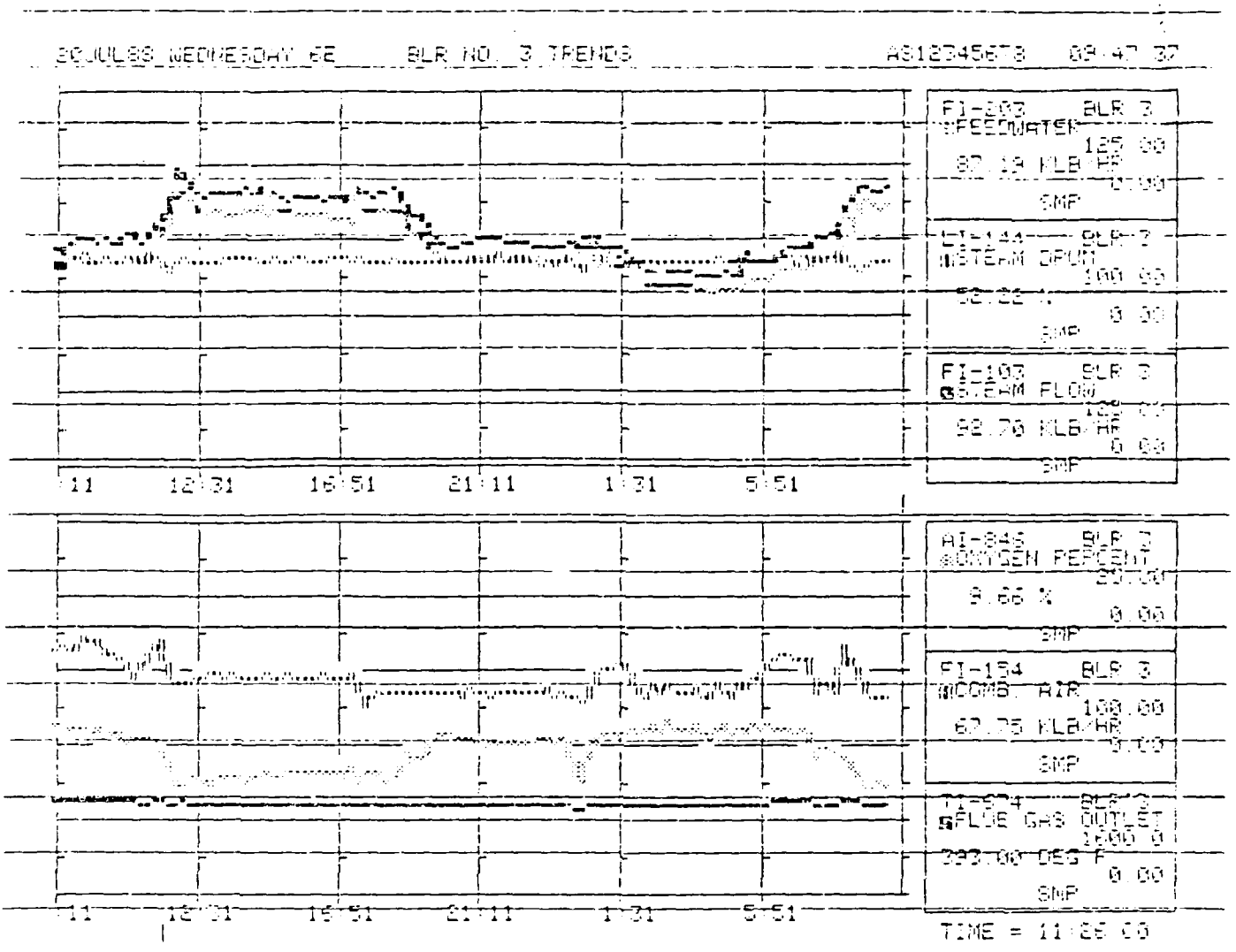

17JUL88 SUNDAY 6E BLR NO. 3 TRENDS 15:46:28
FI-803 BLR 3
FEEDWATER
185.00
97.00 KLB/HR
0.00
SMP
LI-144 BLR 3
STEAM DRUM
100.00
56.13 %
0.00
SMP
FI-103 BLR 3
STEAM FLOW
135.00
107.50 KLB/HR
0.00
SMP
9:11
10:31
11:51
13:11
14:31
TIME = 15:35:00
AI-846 BLR 3
OXYGEN PERCENT
25.00
8.92 %
0.00
SMP
FT-154 AIR 3
COMB. AIR
100.00
56.82 KLB/HR
0.00
SMP
TI-971 BLR 3
FLUE GAS (MILL)
1500.0
390.85 DEG F
0.00
SMP


30JUL88 WEDNESDAY PE BLR NO. 3 TRENDS A81234567B 09:47:37
FI-203 BLR 3
FEEDWATER
125.00
87.19 KLB/HR
0.00
SMP
FI-104 BLR 3
STEAM DRUM
100.00
52.22 %
0.00
SMP
FI-103 BLR 3
STEAM FLOW
100.00
92.70 KLB/HR
0.00
SMP
11 12:31 16:51 21:11 1:31 5:51
AI-845 BLR 3
OXYGEN PERCENT
20.00
3.66 %
0.00
SMP
FI-154 BLR 3
COMB. AIR
100.00
62.75 KLB/HR
0.00
SMP
FLUE GAS OUTLET
1000.0
393.00 DEG F
0.00
SMP
11 12:31 16:51 21:11 1:31 5:51
TIME = 11:26:00

APPENDIX E

Boiler 2, Field Data, 120,000 lbs/hr, 14 July 88

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PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: #1 BOILER #2

DATE: 14 July 88

PLANT: CH&PP

BASE: Eielson AFB

SAMPLE BOX NUMBER:

METER BOX NUMBER:

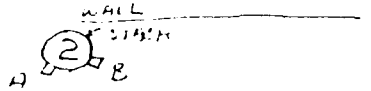
Qw/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION

2nd dr check-18 in Hg

Mult. dine pitot-set up: 4" H_2O



EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

$\bar{T}s = 412°F$

$\bar{T}m = 98°F$

$\Delta H = 3.7$

$PS15 = 32.86$

53,952

AMBIENT TEMP: °F

STATION PRESS: 29.235 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 6' in

NOZZLE AREA (Ø DIA): 0.252 in sq

Cp: Ø.84

DRY GAS FRACTION (Fd)

6 5 3 4

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H2O)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
A 1	0	-6	411		.80	2.3	53.952	95		94	240	71
2	2.5	-6	411		1.5	4.31		94		94	241	68
3	5.0	-7	409		1.6	4.63		95		96	246	74
4	7.5	-7	414		1.6	4.600		94		95	250	85
5	10.0	-7	415		1.5	4.32		99		95	252	97
6	12.5	-7.5	415		1.5	4.33		101		95	253	99
7	15.0	-8.0	415		1.4	4.05		103		96	254	96
8	17.5	-8.0	413		1.3	3.77		103		96	257	91
9	20.0	-8.2	413		1.3	3.77		103		97	258	87
10	22.5	-8.5	412		1.3	3.78		104		97	264	85
11	25.0	-9.0	412		1.2	3.49		105		98	268	83
12	27.5	-8.5	412		1.0	2.91	81.338	105		98	262	81

45

OEHL FORM No. 18

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: #1 (BOILER #2)
DATE: 14 July 85
PLANT: CH&PD
BASE: Eielson
SAMPLE BOX NUMBER: NUTECH 4
METER BOX NUMBER: 2
Qw/Qm:
Co:

SCHEMATIC OF STACK CROSS SECTION

EQUATIONS

$^{\circ}R = {}^{\circ}F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

AMBIENT TEMP: °F
STATION PRESS: 29.35 in Hg
HEATER BOX TEMP: °F
PROBE HEATER SETTING:
PROBE LENGTH: 6 in
NOZZLE AREA (A): sq ft
Cp: .84
DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
B 1	30	-3.0	400		.06	.17	81.338	102		97	246	76
2	32.5	-10.0	408		1.4	4.07		101		98	245	76
3	35.0	-12.0	409		1.6	4.65		101		97	243	76
4	37.5	-12.0	414		1.5	4.34		102		97	245	75
5	40.0	-12.0	415		1.4	4.06		104		98	244	80
6	42.5	-12.0	414		1.35	3.92		103		98	246	81
7	45.0	-12.1	413		1.3	3.78		105		98	245	82
8	47.5	-12.5	413		1.3	3.78		106		98	244	83
9	50.0	-13.0	413		1.25	3.64		106		99	239	82
10	52.5	-13.5	412		1.30	3.77		106		98	251	80
11	55.0	-14.0	413		1.25	3.64		105		99	252	87
12	57.5	-13.0	413		.97	2.83	107.229	106		99	256	85
			[illegible]			[illegible]		[illegible]				
							TOT VOL =	53.277				
						√Ps is	31.655					

OEHL FORM 18 MAY 78

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE	DATE	RUN NUMBER
EIELSON AFB	14 JUNE 88	1

BUILDING NUMBER	SOURCE NUMBER
	BOILER #2

I. PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	0.4919	0.2903	.2016
ACETONE WASHINGS (Probe, Front Half Filter)	105.7112	105.3781	.3331
BACK HALF (If needed)			--
	Total Weight of Particulates Collected		.5347 gm

II. WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)	152 ml	100 ml	52.0 g
IMPINGER 2 (H20)	152 ml	100 ml	52.0 g
IMPINGER 3 (Dry)	14 ml	--	14.0 g
IMPINGER 4 (Silica Gel)	337.3 g	200 g	137.3 g
--	Total Weight of Water Collected		255.3 gm

III. GASES (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	13.6	13.6	13.6		13.6
VOL % O_2	6.0	5.8	5.5		5.9
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

PRELIMINARY SURVEY DATA SHEET NO. 1

(Stack Geometry)

BASE: Eielson AFB	PLANT: CH & PP
DATE: 20 July	SAMPLING TEAM: ECQ
SOURCE TYPE AND MAKE:	
STACK NUMBER: Boilers #2, #3	INSIDE STACK DIAMETER: 52.5 Inches
RELATED CAPACITY: 10	TYPE FUEL: Coal
DISTANCE FROM OUTSIDE OF NIPPLE TO INSIDE DIAMETER: 1.5 Inches	
NUMBER OF TRAVERSES: 2	NUMBER OF POINTS/TRAVERSE: 12

LOCATION OF SAMPLING POINTS ALONG TRAVERSE

POINT	PERCENT OF DIAMETER	DISTANCE FROM INSIDE WALL (Inches)	TOTAL DISTANCE FROM OUTSIDE OF NIPPLE TO SAMPLING POINT (Inches)
1			2.6
2			5.0
3			7.7
4			10.8
5			14.6
6			20.2
7			35.3
8			40.9
9			44.7
10			47.8
11			50.5
12			52.9

OEHL [illegible] 15

PRELIMINARY SURVEY DATA SHEET NO. 2

(Velocity and Temperature Traverse)

+ 2.8 in Dirtt
− 5.4 in Pitot

BASE: Eielson	DATE: July 88
BOILER NUMBER: #2	
INSIDE STACK DIAMETER: 52.5	Inches
STATION PRESSURE: 29.235	In Hg
STACK STATIC PRESSURE: − 1.45	In H20
SAMPLING TEAM: UEHL / ECQ	

TRAVERSE POINT NUMBER	VELOCITY HEAD, V_p IN H20	CYCLONIC $\sqrt{V_p}$ / α	STACK TEMPERATURE (°F)
1	1.1	4°	402
2	1.5	Ø	402
3	1.6	Ø	411
4	1.6	Ø	414
5	1.5	1	414
6	1.4	Ø	414
7	1.3	Ø	414
8	1.3	Ø	413
9	1.3	Ø	412
10	1.3	10	412
11	1.1	Ø	412
12	Ø.84	Ø	410
		1.25°	
	MW_d 28.17		
	FPM 5110	ϕ = Ø.216	
	$\overline{\Delta P}$ 1.32		
	2934		
	$\overline{T_{stack}}$ 411		
	7683		
	DSCFM 43889		
AVERAGE			

OEHL FORM 16

NOZZLE CALIBRATION DATA FORM

Date 14 JUL 88 Calibrated by GMRISCH

Nozzle identification number	Nozzle Diameter[a]			ΔD,[b] mm (in.)	D_{avg}[c]
	D_1, mm (in.)	D_2, mm (in.)	D_3, mm (in.)		
.35	.251	.252	.252	0.001	0.252

where:

[a] $D_{1,2,3,}$ = three different nozzles diameters, mm (in.); each diameter must be within (0.025 mm) 0.001 in.

[b] ΔD = maximum difference between any two diameters, mm (in.), $\Delta D \leq$ (0.10 mm) 0.004 in.

[c] D_{avg} = average of D_1, D_2, and D_3.

VISIBLE EMISSION OBSERVATION FORM

RUN #1
No. 1 of 2

COMPANY NAME: EIELSON AFB
STREET ADDRESS:
CITY: | STATE: | ZIP:
PHONE (KEY CONTACT): | SOURCE ID NUMBER: CH+PP

PROCESS EQUIPMENT: COAL-FIRED BOILER #2 | OPERATING MODE:
CONTROL EQUIPMENT: MULTICLONES | OPERATING MODE:

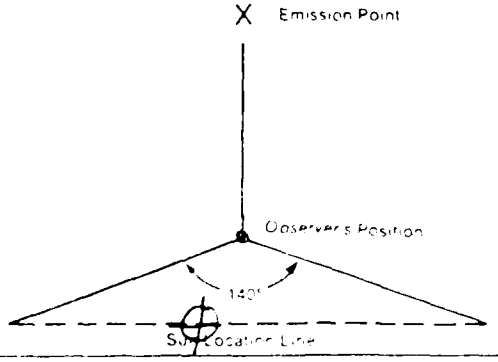
DESCRIBE EMISSION POINT: TAPERED STACK SE CORNER OF BLDG.
(EACH BOILER HAS DEDICATED STACK)
HEIGHT ABOVE GROUND LEVEL: 14" ABOVE ROOF | HEIGHT RELATIVE TO OBSERVER: Start 14" End
DISTANCE FROM OBSERVER: Start 90' End | DIRECTION FROM OBSERVER: Start SSW End

DESCRIBE EMISSIONS: CONTINUOUS PLUME
Start: CONTINUOUS End:
EMISSION COLOR: Start LT BROWN End | IF WATER DROPLET PLUME: Attached ☐ N/A Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: Start 2-4" ABOVE STACK End

DESCRIBE PLUME BACKGROUND: Start SLIGHTLY HAZY End
BACKGROUND COLOR: Start CREEK WATER/BLUE End SAME | SKY CONDITIONS: Start SCATTERED End SAME
WIND SPEED: Start CALM End SAME | WIND DIRECTION: Start CALM End SAME
AMBIENT TEMP: Start 75°F End 78°F | WET BULB TEMP: | RH, percent:

SOURCE LAYOUT SKETCH — Draw North Arrow

Stack with Plume
Sun
Wind



ADDITIONAL INFORMATION:

OBSERVATION DATE	START TIME	END TIME
14 JUNE 88		

SEC / MIN	0	15	30	45	COMMENTS
1	5	5	5	5	
2	5	5	5	5	ALL RUNS
3	5	5	5	5	EXHIBITED SAME
4	5	5	5	5	OPACITY
5	5	5	5	5	
6	5	5	5	5	
7	5	5	5	5	
8	5	5	5	5	
9	5	5	5	5	
10	5	5	5	5	
11	5	5	5	5	
12	5	5	5	5	
13	5	5	5	5	
14	5	5	5	5	
15	5	5	5	5	
16	5	5	5	5	
17	5	5	5	5	
18	5	5	5	5	
19	5	5	10	5	
20	10	10	5	5	
21	5	5	10	10	SLIGHT UPSET - GREATEST
22	15	10	10	10	OPACITY OCCURRED BETWEEN
23	10	10	10	5	21:15 + 21:30.
24	5	5	5	5	
25	5	5	5	5	
26	5	5	5	5	
27	5	5	10	10	
28	10	10	10	5	
29	5	5	5	5	
30	5	5	5	5	BOILER - MOVE TO PLOT B

OBSERVER'S NAME (PRINT): MAJ JAMES A. GARRISON
OBSERVER'S SIGNATURE: James A. Garrison | DATE: 14 JUNE 88
ORGANIZATION: USAFCEHL/ECG
CERTIFIED BY: EASTERN TECHNICAL ASSOCIATE (STATE CERTIFIED OBSERVER) | DATE: 1 JUNE 88

CONTINUED ON VEO FORM NUMBER:

VISIBLE EMISSION OBSERVATION FORM

RUN #1
No. 2 of 2

COMPANY NAME		
STREET ADDRESS		
CITY	STATE	ZIP
PHONE (KEY CONTACT)	SOURCE ID NUMBER BOILER #2	

PROCESS EQUIPMENT	OPERATING MODE
CONTROL EQUIPMENT	OPERATING MODE

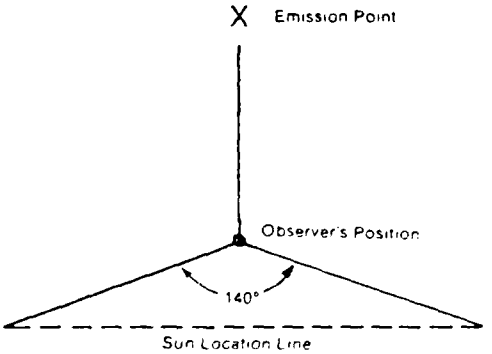
DESCRIBE EMISSION POINT	
HEIGHT ABOVE GROUND LEVEL	HEIGHT RELATIVE TO OBSERVER Start End
DISTANCE FROM OBSERVER Start End	DIRECTION FROM OBSERVER Start End

DESCRIBE EMISSIONS Start End	
EMISSION COLOR Start End	IF WATER DROPLET PLUME Attached ☐ Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start End	

DESCRIBE PLUME BACKGROUND Start End		
BACKGROUND COLOR Start End	SKY CONDITIONS Start End	
WIND SPEED Start End	WIND DIRECTION Start End	
AMBIENT TEMP Start End	WET BULB TEMP	RH, percent

Stack with Plume
Sun
Wind

SOURCE LAYOUT SKETCH — Draw North Arrow



ADDITIONAL INFORMATION

OBSERVATION DATE	START TIME	END TIME

SEC / MIN	0	15	30	45	COMMENTS
1	5	5	5	5	
2	5	5	5	5	
3	10	10	10	10	
4	10	10	10	10	
5	10	10	10	5	
6	5	5	5	5	
7	5	5	5	10	
8	10	5	5	5	
9	5	5	5	5	
10	5	5	5	5	
11	5	5	5	5	
12	5	5	5	5	
13	5	10	10	10	
14	10	10	5	5	
15	5	5	5	5	
16	5	5	5	5	
17	5	5	5	5	
18	5	5	5	10	
19	10	10	10	5	
20	5	10	10	5	
21	5	5	5	10	
22	5	5	5	5	
23	5	5	5	5	
24	5	5	10	10	
25	10	10	10	5	
26	10	10	10	10	
27	10	10			
28					
29					
30					

OBSERVER'S NAME (PRINT)	
OBSERVER'S SIGNATURE	DATE
ORGANIZATION	
CERTIFIED BY	DATE

CONTINUED ON VEO FORM NUMBER						

APPENDIX F

Boiler 3, Field Data, 100,000 lbs/hr, 17 July 88

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1.736 1 of 2

Boiler #3

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: #1

DATE: 17 July

PLANT: CI&E DD

BASE: Erelson

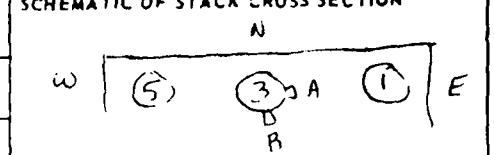
SAMPLE BOX NUMBER: RAC

METER BOX NUMBER:

Qw/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION



Pre Leak check ✓ good @ 15 in Hg

ΔP across multiliners 4

EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

100,000 lb/hr

Soot Blow

AMBIENT TEMP: 74 °F

STATION PRESS: 29.62Φ in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 72 in

NOZZLE AREA: .254 in

Cp: .84

DRY GAS ~~FRACTION~~ (Fd) MW: 28.17

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
A 1	0	1.5	358		1.1	2.79	761.929	80		75	266	
2	2.5	2.5	365		1.5	3.82		90		76	275	
3	5.0	5.0	366		1.8	4.65		107		76	273	
4	7.5	6.0	365		2.0	5.22		115		79	261	
5	10.0	6.5	365		1.95	5.12		119		81	264	
6	12.5	7.0	365		1.95	5.13		122		82	241	
7	15.0	7.0	365		1.85	4.85		124		82	264	
8	17.5	7.5	365		1.9	5.07		124		85	242	
9	20.0	7.0	365		1.85	4.88		121		85	263	
10	22.5	6.5	364		1.20	3.17		113		85	240	
11	25.0	6.0	368		0.70	1.84		119		86	260	
12	27.5	0.5	366		0.01	0.03		115		86	243	

OEHL FORM MAY 78 18

55

Continuation 2 of 2

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: #1

DATE: 17 July 85

PLANT: CH&NP

BASE: Erlson

SAMPLE BOX NUMBER: RAC

METER BOX NUMBER:

Qw/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION

Post Leak check, good at 20 in Hg

2.5 min interval

EQUATIONS

$T_R = {}^{o}F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

100,000 lb/hr

AMBIENT TEMP: 75 °F

STATION PRESS: 29.62 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: , in

NOZZLE AREA (A): .254 sq ft

Cp: .84

DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
B1 (1st)	0	3.5	353		.63	1.64	789.800	92		82	248	
2	2.5	6.0	355		.74	1.94		102		85	248	
3	5.0	13.5	356		1.75	4.54		103		84	239	
4	7.5	13.5	358		1.65	4.33		108		84	262	
5	10.0	16.0	358		1.85	4.82		113		84	270	
6	12.5	16.5	360		1.85	4.84		116		85	258	
7	15.0	19.5	362		1.80	4.74		116		86	266	
8	17.5	20.0	358		1.86	4.84		117		86	243	
9	20.0	20.0	358		1.82	4.80		117		85	261	
10	22.5	20.0	358		1.80	4.74		116		85	243	
11	25.0	13.5	357		1.20	3.16		109		84	254	
12	27.5	10.0	357		.80	2.10	818.252	106	97	84	260	
			361			3.89						

$\overline{\sqrt{P_{STS}}} = 33.8855$

Calc 1st 818.252 − 761.929 = 56.323

OEHL FORM 18 MAY 78

96

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE	DATE	RUN NUMBER
EIELSON AFB	17 JULY 88	1

BUILDING NUMBER	SOURCE NUMBER
	BOILER #3

I. **PARTICULATES**

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	0.6714	0.2854	0.3860
ACETONE WASHINGS (Probe, Front Half Filter)	107.5106	107.4366	0.3740
BACK HALF (If needed)			
	Total Weight of Particulates Collected		0.7600 gm

II. **WATER**

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)	177	100	77
IMPINGER 2 (H20)	140	100	40
IMPINGER 3 (Dry)	8.6	0.0	8.6
IMPINGER 4 (Silica Gel)	336.4	300	36.4
	Total Weight of Water Collected		gm

III. **GASES** (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	10.6	10.6	10.6	10.6	10.6
VOL % O_2	8.8	8.8	8.8	8.8	8.8
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

AMD FORM FEB 84 651 REPLACES OEHL 20 MAY 78 WHICH IS OBSOLETE

ΔHa = 1.736

1 of 2

Boiler #3 PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: #2

DATE: 17 July, 84

PLANT: CII & PP

BASE: Tiel-son

SAMPLE BOX NUMBER: R-AC

METER BOX NUMBER:

Cx/Qm:

Cp:

SCHEMATIC OF STACK CROSS SECTION

W N E S

C 3 B C1

A

Pre Leak check good at 15

3 min intervals

EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

100,000 ft/hr

AMBIENT TEMP: 77 °F

STATION PRESS: 29.62Ø in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 72 in

NOZZLE AREA ~~(A)~~ Θ: .155 sq ft

Cp: .84

DRY ~~GAS FRACTION~~ (Fd): MW 28.17

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
1154→ A 1	C	Ø.Ø	354		.46	Ø.16	815.512	87	-	81	252	
1152→ B 2	5	Ø.Ø	356		.73	Ø.24		84		81	263	
3	C	Ø.Ø	351		1.4	Ø.50		87		82	275	
4	E	Ø.2	356		1.5	Ø.54		90		82	234	
5	10 C	Ø.5	362		1.8	Ø.64		93		83	260	
6	12.5	Ø.5	364		1.8	Ø.64		94		83	248	
7	15 C	Ø.5	367		1.8	Ø.64		94		83	253	
8	17.5	Ø.8	367		1.9	Ø.66		93		84	263	
9	20 C	Ø.8	367		1.85	Ø.66		96		82	266	
10	22.5	Ø.7	367		1.75	Ø.62		97		83	260	
11	25 C	Ø.6	366		1.20	Ø.43		96		83	246	
12	27.5	Ø.2	365		Ø.55	Ø.20		91		83	254	
	3 min	sample	time									
							849					

58

OEHL FORM 18 MAY 78

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: #2

DATE: 17 Jun 88

PLANT: CHEPP

BASE: Edison

SAMPLE BOX NUMBER: RAC

METER BOX NUMBER:

Qw/Qm:

Cs:

SCHEMATIC OF STACK CROSS SECTION

Post Leak check - good at 2C

EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

100,000 dscf/hr

AMBIENT TEMP: 78 °F

STATION PRESS: 29.60 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 72 in

NOZZLE AREA (A): .55 sq ft

Cp: .84

DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
B 1	5	.05	355		1.25	0.45	~~850.890~~	83		81	253	
2	7.5	.5	358		1.55	0.55	843.621	84		82	251	
3	10.0	.8	364		1.75	0.62		85		81	274	
4	12.5	1.0	366		1.90	0.67		84		81	231	
5	15.0	1.0	368		1.90	0.67		88		82	253	
6	17.5	1.0	368		1.9	0.67		89		82	245	
7	19.0	1.6	368		1.85	0.65		92		81	263	
8	17.5	2.2	368		1.85	0.65		93		81	234	
9	20.0	2.5	368		1.85	0.66		94		81	261	
10	23.5	2.0	368		1.10	0.43		94		82	260	
11	25.0	1.0	366		.58	0.21		94		82	234	
12	27.5	1.0	366		.56	0.20	848.551	92		83		
			~~363~~			$\bar{H}$ = .52	30.039		~~86~~			

$\sqrt{\bar{H}13} = 33.905$?

Cu Ft = 848.551 − 818.512 = 30.039

OSHA FORM 18

59

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE	DATE	RUN NUMBER
EIELSON	17 JULY 88	#2

BUILDING NUMBER	SOURCE NUMBER
CH + PP	BOILER #3

I. PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	0.4415	0.2850	0.1565
ACETONE WASHINGS (Probe, Front Half Filter)	99.7674	99.6269	0.1405
BACK HALF (If needed)			
	Total Weight of Particulates Collected		0.2970 gm

II. WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)	143	100	43
IMPINGER 2 (H20)	114	100	14
IMPINGER 3 (Dry)	4	0	4
IMPINGER 4 (Silica Gel)	310.7	300	10.7
	Total Weight of Water Collected		71.7 gm

III. GASES (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	10.6	10.6	10.6		10.6
VOL % O_2	8.4	8.4	8.4		8.4
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

zHa 1736

1 of 2

Boiler #3

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: #3

DATE: 17 Jul, 88

PLANT: EH&PP

BASE: Elgin

SAMPLE BOX NUMBER: RfC

METER BOX NUMBER:

Qw/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION

N
W S E

(5) (3) (2) (1)

A

Pitot Leak check at 15 in Hg good

EQUATIONS

$^{\circ}R = {}^{\circ}F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

100, 000 lb/hr

AMBIENT TEMP: 78 °F

STATION PRESS: 29.62 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 72 in

NOZZLE AREA (A): .155 sq ft

Cp: .84

DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
A 1	0	.01	350		.55	0.20	848.727	82		81	240	
2	3.5	.5	365		0.50	0.28		86		82	254	
3	7.0	1.6	378		1.20	0.42		88		87	261	
4	10.5	2.1	380		1.60	0.56		91		89	271	
5	14.0	2.4	381		1.80	0.63		94		87	258	
6	17.5	2.5	381		1.84	0.63		92		83	247	
7	21.0	2.7	381		1.82	0.63		94		84	233	
8	24.5	2.7	381		1.80	0.63		97		84	231	
9	28.0	2.8	381		1.85	0.65		96		84	240	
10	31.5	2.6	379		1.65	0.58		94		83	225	
11	35.0	2.3	379		1.20	0.42		95		83	253	
12	38.5	2.0	350		0.79	0.28		95		83	272	
	42.0											

OEHL FORM 18 MAY 78

19

(cont) 2 of 2

Run 4 3

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: #3
DATE: 17 July
PLANT: CHS (P)
BASE: Edison
SAMPLE BOX NUMBER: RPC
METER BOX NUMBER:
Delta H@:

SCHEMATIC OF STACK CROSS SECTION

Post Leak check at 5 in Hg

100,000 lb/hr

TOTAL TIME 84 min

EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

AMBIENT TEMP: 78 °F
STATION PRESS: 29.62 in Hg
HEATER BOX TEMP: °F
PROBE HEATER SETTING:
PROBE LENGTH: 72 in
NOZZLE AREA (A): .155 ~~sq ft~~ in
Cp: .84
DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
B 1	0	2.1	361		1.1	Φ.39	865.094	90		83	257	
2	3.5	2.5	376		1.4	Φ.49		92		84	251	
3	7.0	3.1	381		1.65	Φ.61		93		85	253	
4	10.5	3.2	384		1.9Φ	Φ.67		94		85	263	
5	14.0	3.5	383		1.95	Φ.68		96		84	267	
6	17.5	3.5	383		1.9Φ	Φ.66		94		85	225	
7	21.0	3.5	383		1.8	Φ.63		92		84	275	
8	24.5	3.2	378		1.8	Φ.63		89		84	239	
9	28.0	3.4	378		1.7	Φ.59		90		83	270	
10	31.5	2.6	378		Φ.89	Φ.31		91		82	225	
11	35.0	1.6	379		Φ.31	Φ.11		90		83	254	
12	38.5		377		Φ.11	Φ.04	881.041	89		84	273	
	42 stop		~~Tavg~~ = 377			ΔH = Φ.49			88			

$\sqrt{P_{STS}} = 33.215$

cubic ft 881.041 − 849.727 = 32.314

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE	DATE	RUN NUMBER
Eielson	17 July 88	#3

BUILDING NUMBER	SOURCE NUMBER
CH & DD	Boiler #3

I. PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	0.4352	.2877	.1475
ACETONE WASHINGS (Probe, Front Half Filter)	98.8771	98.7231	.1540
BACK HALF (If needed)			
	Total Weight of Particulates Collected		.3015 gm

II. WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H_2O)	194 ml's	100	94
IMPINGER 2 (H_2O)	70 ml's	100	-30
IMPINGER 3 (Dry)	1 ml	0	1
IMPINGER 4 (Silica Gel)	318.6	300	18.6
	Total Weight of Water Collected		83.6 gm

III. GASES (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	10.6	10.6	10.6		10.6
VOL % O_2	8.4	8.4	8.4		8.4
VOL % CO					
VOL % N_2					

Vol % N_2 = 100% - % CO_2 - % O_2 - % CO

OEHL FORM MAY 78 20

PRELIMINARY SURVEY DATA SHEET NO. 1

(Stack Geometry)

BASE: Eielson AFB	PLANT: CH & PP
DATE: 4-20 July	SAMPLING TEAM: ECQ
SOURCE TYPE AND MAKE:	
SOURCE NUMBER: Boilers #2, #3	INSIDE STACK DIAMETER: 52.5 Inches
RELATED CAPACITY: 10	TYPE FUEL: Coal
DISTANCE FROM OUTSIDE OF NIPPLE TO INSIDE DIAMETER: 1.5 Inches	
NUMBER OF TRAVERSES: 2	NUMBER OF POINTS/TRAVERSE: 12

LOCATION OF SAMPLING POINTS ALONG TRAVERSE

POINT	PERCENT OF DIAMETER	DISTANCE FROM INSIDE WALL (Inches)	TOTAL DISTANCE FROM OUTSIDE OF NIPPLE TO SAMPLING POINT (Inches)
1			2.6
2			5.0
3			7.7
4			10.8
5			14.6
6			20.2
7			35.3
8			40.9
9			44.7
10			47.8
11			50.5
12			52.9

OEHL [illegible] 15

PRELIMINARY SURVEY DATA SHEET NO. 2

(Velocity and Temperature Traverse)

PLANT: Eielson — DATE: 17 July 88

BOILER NUMBER: #3

INSIDE STACK DIAMETER: 52.5 Inches — Pitot -37 +53

BAROMETRIC PRESSURE: 29.62 In Hg

STACK STATIC PRESSURE: -1.9 In H2O

SAMPLING TEAM: EPA

TRAVERSE POINT NUMBER	VELOCITY HEAD, V_p IN H2O	CYCLONIC FLOW, α	STACK TEMPERATURE (°F)
1	0.74	1°	355
2	0.91	3	356
3	1.3	1	358
4	1.6	1	360
5	1.9	2	360
6	1.9	2	360
7	1.9	2	360
8	~~1.85~~ 1.9	1	361
9	~~1.85~~ 1.85	2	360
10	~~1.80~~ 1.80	2	359
11	~~0.55~~ 1.80	3	359
12	0.53	4	357
	Mw = 28.17	AV. = 1.5°	
		FS = 6	
AVERAGE			

OEHL [illegible] 16

NOZZLE CALIBRATION DATA FORM

Date 17 July 88 Calibrated by Fagin

Nozzle identification number	Nozzle Diameter[a] D_1, mm (in.)	D_2, mm (in.)	D_3, mm (in.)	ΔD,[b] mm (in.)	D_{avg}[c]
Stack #3 run 1 .25	.254	.254	.253	.001	.254
run 2 & 3 .15	.155	.155	.154	.001	.155
18 July	.250	.250	.251	.001	.250

where:

[a] $D_{1,2,3}$ = three different nozzles diameters, mm (in.); each diameter must be within (0.025 mm) 0.001 in.

[b] ΔD = maximum difference between any two diameters, mm (in.), $\Delta D \leq$ (0.10 mm) 0.004 in.

[c] D_{avg} = average of D_1, D_2, and D_3.

Quality Assurance Handbook M5-2.6

VISIBLE EMISSION OBSERVATION FORM

No.

COMPANY NAME: EIELSON AFB
STREET ADDRESS:
CITY: | STATE: AK | ZIP:
PHONE (KEY CONTACT): | SOURCE ID NUMBER: BOILER # 3

PROCESS EQUIPMENT: COAL-FIRED BOILER | OPERATING MODE: 100,000 LB/HR
CONTROL EQUIPMENT: MULTICLONE | OPERATING MODE:

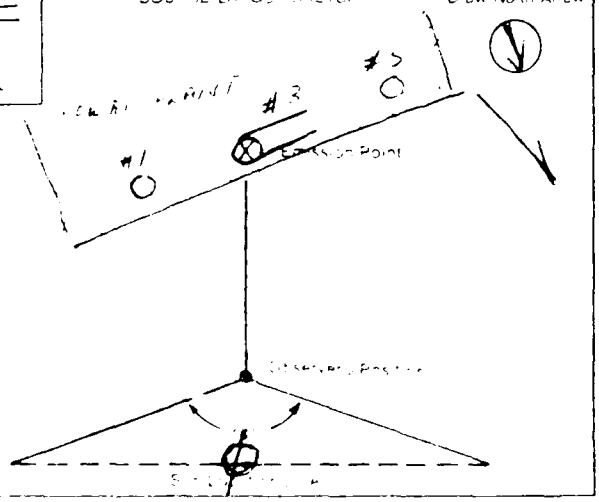
DESCRIBE EMISSION POINT: TAPERED STEAL STACK
HEIGHT ABOVE GROUND LEVEL: 108' | HEIGHT RELATIVE TO OBSERVER: Start 108' End SAME
DISTANCE FROM OBSERVER: Start 350' End SAME | DIRECTION FROM OBSERVER: Start End

DESCRIBE EMISSIONS: Start CONING End SAME
EMISSION COLOR: Start LT BROWN End SAME | IF WATER DROPLET PLUME: Attached N/A Detached
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: Start 1-5' ABOVE STACK End SAME

DESCRIBE PLUME BACKGROUND: Start BLUE SKY HAZY End SAME
BACKGROUND COLOR: Start BLUE SKY End SAME | SKY CONDITIONS: Start SCATTERED End SAME
WIND SPEED: Start 6 KTS End SAME | WIND DIRECTION: Start SE End SAME
AMBIENT TEMP: Start 75 °F End | WET BULB TEMP: RH percent

Stack with Plume
Sun
Wind

SOURCE LAYOUT SKETCH — Draw North Arrow



OBSERVATION DATE	START TIME	END TIME
17 JUL 88		

SEC / MIN	0	15	30	45	COMMENTS
1	5	5	5	5	ALL RUNS
2	5	10	5	5	EXHIBITED SMOKE
3	5	5	5	5	CHARACTY
4	5	5	10	5	
5	5	10	10	10	
6	10	10	10	5	
7	5	5	5	5	
8	5	5	5	5	
9	5	5	5	5	
10	5	5	5	10	
11	5	5	5	5	
12	5	5	5	10	
13					
14					
15					
16					
17					
18					
19					
20	50	75	75	50	
21	30	20	60	5	
22	20	40	50	10	
23					
24					
25					
26					
27					
28					
29					
30					

OBSERVER'S NAME (PRINT):
OBSERVER'S SIGNATURE | DATE
ORGANIZATION
CERTIFIED BY | DATE

CONTINUED ON VEO FORM NUMBER:

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APPENDIX G

Boiler 3, Field Data, 100,000 lbs/hr, 18 July 88

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Ha 207

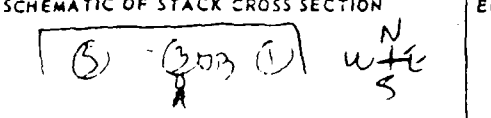
Run #3

PARTICULATE SAMPLING DATA SHEET

1 of 2

RUN NUMBER: #1
DATE: 18 July 88
PLANT: CHG TP
BASE: Nelson
SAMPLE BOX NUMBER: 2410 NUTECH
METER BOX NUMBER:
Qw/Qm:
Co:

SCHEMATIC OF STACK CROSS SECTION



Tie Leak check at 19 in Hg
ΔP across multiline 4
MW = 30.0
H_2O = 10.5
static P = -1.1

EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

WIND 13005

100,000 lb/m

Coal Sample ~~2256~~ 3792

AMBIENT TEMP: 77 °F
STATION PRESS: 29.789 in Hg
HEATER BOX TEMP: °F
~~PROBE HEATER~~ SETTING: FPS = 80
PROBE LENGTH: ~~6~~ 72 in
NOZZLE AREA (A): .256 sq ft
Cp: .84
DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	~~STATIC PRESSURE (in H2O)~~ ΔP in Hg	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
1	0	-3.0	380		.62	1.64	203.427	97		98	235	54
2	2.5	-3.0	388		.81	2.13		97		99	243	56
3	5.0	-4.0	383		1.1	2.96		99		98	243	57
4	7.5	-5.5	383		1.55	4.10		101		98	246	53
5	10.0	-6.5	390		1.75	4.63		103		99	249	60
6	12.5	-6.5	392		1.75	4.63		105		99	251	65
7	15.0	-7.0	388		1.75	4.63		106		99	248	66
8	17.5	-8.0	387		1.80	4.79		107		100	250	75
9	20.0	-8.0	388		1.75	4.66		107		100	246	72
10	22.5	-8.0	386		1.65	4.4		108		100	235	71
11	25.0	-7.0	385		1.25	3.34		103		100	252	73
12	27.5	-6.0	385		.98	2.62		107		100	257	75
			$\bar{T}_s$ = 388.2		ΔP 1.40	ΔH = 3.73				IN/out T = 103		

~~PTSTS~~ = 34.0274

CUBIC FT = 54.251

PARTICULATE SAMPLING DATA SHEET

2 of 2

RUN NUMBER: #1 continued

DATE: 18 July 82

PLANT: CH DPI

BASE: Lapland

SAMPLE BOX NUMBER: 2K14

METER BOX NUMBER:

Qw / Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION

Pitot tube coefficient - 11 0

EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

100,000 .66/67

Moisture based from 230.531 to 230,620 .087

AMBIENT TEMP: 78 °F

STATION PRESS: 29.789 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 72 in

NOZZLE AREA (A): .25 0 sq ft

Cp: .84

DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
01	0	-6.4	385		.96	2.55	230.240	102		100	258	69
2	5	-6.6	387		1.15	3.05		102		100	261	69
3	5.6	-8.0	388		1.64	4.25		104		100	263	65
4	5.0	-9.5	387		1.75	4.66		105		100	262	73
5	10.2	-12.6	387		1.80	4.78		106		100	265	78
6	10.2	-12.2	387		1.80	4.79		107		100	260	76
7	15.0	-10.3	387		1.74	4.65		108		101	262	78
8	15.5	-10.7	386		1.75	4.68		108		102	262	78
9	20.6	-10.8	387		1.65	4.41		108		102	263	89
10	20.5	-7.0	385		1.15	3.08		105		102	262	80
11	25.6	-8.4	385		0.82	2.24		108		102	265	76
12	25.7	-6.5	386		0.62	1.66	257.767	108		102	262	76
			1154									

OEHL FORM MAY 78 18

72

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE	DATE	RUN NUMBER
EIELSON AFB	18 JULY 88	BOILER 3 R1

BUILDING NUMBER	SOURCE NUMBER
CH+PP	BOILER 3

I. PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	0.5928	0.2857	0.3072
ACETONE WASHINGS (Probe, Front Half Filter)	107.7100	107.4346	0.2754
BACK HALF (If needed)			
	Total Weight of Particulates Collected		0.5806 gm

II. WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)	141	100	41
IMPINGER 2 (H20)	138	100	38
IMPINGER 3 (Dry)	11.9	0	11.9
IMPINGER 4 (Silica Gel)	327.1	300	27.3
	Total Weight of Water Collected		118.2 gm

III. GASES (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	9.0	9.0	9.0		9.0
VOL % O_2	9.6	9.6	9.6		9.6
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

AMD FORM FEB 84 651 REPLACES OEHL 20, MAY 78, WHICH IS OBSOLETE

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: #2

DATE: 18 July 88

PLANT: Eletson

BASE: CH PD

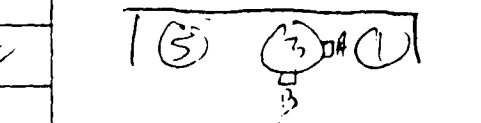
SAMPLE BOX NUMBER: 2 (1) 10

METER BOX NUMBER:

Qw/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION



EQUATIONS

$^{\circ}R = {}^{\circ}F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

100,000 W/hr

Coal Sample 3798

AMBIENT TEMP: 79 °F

STATION PRESS: 29.789 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 72 in

NOZZLE AREA ~~(A)~~: .25 sq ft

Cp: .87

DRY GAS FRACTION (Fd):

VAC

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC ~~PRESSURE~~ (in H2O)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
1	0	-6.5	385		0.72	2.45	257.965	100		101	250	58
2	2.5	-8.5	386		1.10	2.93		102		104	248	57
3	5.0	-11.5	388		1.40	3.72		104		104	250	56
4	7.5	-16.5	386		1.75	4.66		106		104	255	60
5	10.0	-18.5	388		1.80	4.79		105		104	258	61
6	12.5	-18.5	387		1.8	480		106		102	252	64
7	15.0	-18.5	387		1.75	467		106		102	255	64
8	17.5	-17.8	387		1.8	4.58		106		102	258	64
~~9~~	~~20.0~~	~~-18.0~~	~~387~~		1.8	4.80		105		102	262	64
9	20.0	-18.7	387		1.5	4.06		103		102	263	66
10	12.5	-8.5	387		.65	1.81		103		102	264	65
11	15.0	-3.0	386		.15	0.46		105		102	264	65
12	27.5	-3.4	386		.14	0.37	282.754	105		102	264	66
	Tm = 104	Ts = 386										
		~~ΔP =~~										
		ΔH = 342										
		PSB = 31.8630										

OEHL FORM 18 MAY 78

Boiler #3 PARTICULATE SAMPLING DATA SHEET 2 of 2

RUN NUMBER #2	SCHEMATIC OF STACK CROSS SECTION	EQUATIONS	AMBIENT TEMP °F
DATE 18 July		$°R = °F + 460$	STATION PRESS in Hg
PLANT CHPD		$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$	HEATER BOX TEMP °F
BASE Eielson		1st Intermediate leak check at 10 in Hg .002	PROBE HEATER SETTING
SAMPLE BOX NUMBER		to 282.873	PROBE LENGTH in
METER BOX NUMBER		from 282.754 / .119	NOZZLE AREA (A) sq ft
Qw/Qm	11 Cscc 6//c1	2nd Intermediate .119	Cp
Co		to 282.971 / from 282.873 — .119 .098 / .217	DRY GAS FRACTION (Fd)

VAC in Hg

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC ~~PRESSURE~~ (in H2O)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
B 1	0	-6.0	385		0.51	1.36	282.873	102		102	259	60
2	2.5	-8.0	385		0.72	1.92		103		101	258	56
3	5.0	-11.5	386		1.10	2.93		104		102	259	56
4	7.5	-14.0	386		1.50	4.01		105		101	260	52
5	10.0	-17.0	387		1.70	4.54		107		102	258	61
6	12.5	-17.5	388		1.70	4.54		107		102	256	60
7	15.0	-19.5	388		1.75	4.67		108		102	260	62
8	17.5	-19.8	387		1.75	4.68		108		102	261	64
9	20.0	-20.0	386		1.7	4.54		106		102	260	65
10	22.5	-20.0	387		1.65	4.40		106		102	262	72
11	25.0	-18.0	382		1.15	3.09		106		104	264	72
12	27.5	-12.0	383		0.74	1.99	307.732	106		101	265	73

CU FT = 49.550

0552

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE	DATE	RUN NUMBER
Eielson	18 July	2

BUILDING NUMBER	SOURCE NUMBER
CH DP	Boiler #3

I. PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	Ø.5698	.2876	.2822
ACETONE WASHINGS (Probe, Front Half Filter)	99.8128	99.6269	.1859
BACK HALF (if needed)			
	Total Weight of Particulates Collected		.4673 gm

II. WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)	168	100	68
IMPINGER 2 (H20)	111	100	11
IMPINGER 3 (Dry)	5.4	—	5.4
IMPINGER 4 (Silica Gel)	333	300	33
	Total Weight of Water Collected		117.4 gm

III. GASES (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	10.0	10.0	10.0		10.0
VOL % O_2	9.4	9.4	9.4		9.4
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

OEHL FORM MAY 78 20

Stk 207

Boiler #3

PARTICULATE SAMPLING DATA SHEET

1 of 2

RUN NUMBER: #3

DATE: 8 J. 6

PLANT: (illegible)

BASE: E. Bolton

SAMPLE BOX NUMBER: 704

METER BOX NUMBER:

Qa/Qm:

Cp:

SCHEMATIC OF STACK CROSS SECTION

SOOT BLOW at 1230

stopped at 1432

(5 Ports C)

Leak check at 2.0 in Hg good

1.5 cfm 10/11

Ps = 1.1

EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

Coal sample 3786

AMBIENT TEMP: 79 °F

STATION PRESS: 29.789 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 72 in

NOZZLE AREA (A): .25 sq ft

Cp: .84

DRY GAS FRACTION (Fd): New = 30.0

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
A 1	0	-2.6	384		1.68	1.66	301.713	102		101	267	73
2	2.5	-2.6	384		0.74	1.81		102		101	267	78
3	5.0	-2.0	386		1.14	2.93		104		102	270	74
4	7.5	-5.0	386		1.45	3.87		106		102	272	67
5	10.0	-6.5	387		1.16	4.54		109		103	272	70
6	12.5	-5.5	387		1.13	4.46		110		103	266	65
7	15.0	-7.0	386		1.25	4.91		111		103	259	88
8	17.5	-7.5	386		1.25	4.71		111		103	257	88
9	20.0	-7.2	384		1.23	4.72		111		104	273	88
10	22.5	-7.4	386		1.20	4.57		111		103	270	86
11	25.0	-5.0	386		1.05	2.82		111		104	266	79
12	27.5	-5.6	385		0.78	2.10	335.917	110		105	259	75

Stk at 1545

PARTICULATE SAMPLING DATA SHEET

2 of 2

RUN NUMBER	# 3
DATE	16 July
PLANT	[illegible]
BASE	[illegible]
SAMPLE BOX NUMBER	
METER BOX NUMBER	
ΔH@ Qm	
Co	

SCHEMATIC OF STACK CROSS SECTION

[illegible] at 15 [illegible] good

[illegible] 6/71

[illegible]

EQUATIONS

$^{o}R = {}^{o}F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

AMBIENT TEMP (°F)	72
STATION PRESS (in Hg)	"
HEATER BOX TEMP (°F)	"
PROBE HEATER SETTING	"
PROBE LENGTH (in)	72
NOZZLE AREA (A) (sq ft)	.25
Cp	.81
DRY GAS FRACTION (Fd)	

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H2O)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
B1	0	-6.6	385		.90	2.41	335.917	107		104	267	67
2	2.5	-7.4	384		1.15	3.09		107		104	260	63
3	5.0	-8.5	381		1.54	4.02		108		104	266	65
4	7.5	-10.4	381		1.79	4.45		108		103	267	71
5	10.0	[illegible]	385		1.87	4.83		107		104	269	75
6	12.5	-11	382		1.86	4.85		107		104	266	78
7	15.0	-11	384		[illegible]	[illegible]		107		104	266	79
8	17.5	-12.4	382		1.75	4.72		107		104	268	79
9	20.0	-12.6	377		1.70	4.61		108		104	268	75
10	22.5	-10.4	380		1.53	4.19		108		104	269	73
11	25.0	-9.5	381		[illegible]	2.59		108		104	262	69
12	27.5	-8.4	380		0.68	1.81	363.475	108		105	263	68
			T_s = 384						T = 106			

$\overline{\Delta H}$ = 3.74

$\sqrt{PSTS}$ = 33.896

Cu Ft = 53.712

FORM 18

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE	DATE	RUN NUMBER
EIELSON	18 July 88	3

BUILDING NUMBER	SOURCE NUMBER
CH & PP	BOILER 3

I. PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	0.7544	0.2851	0.4693
ACETONE WASHINGS (Probe, Front Half Filter)	99.2970 ~~0.7~~	98.7231	0.5739
BACK HALF (If needed)			
	Total Weight of Particulates Collected		1.0332 gm

II. WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)	140	100	40
IMPINGER 2 (H20)	144	100	44
IMPINGER 3 (Dry)	12	0	12
IMPINGER 4 (Silica Gel)	334	300	34
	Total Weight of Water Collected		124.1 gm

III. GASES (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	10.0	10.0	10.2		10.1
VOL % O_2	9.4	9.4	9.6		9.5
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

PRELIMINARY SURVEY DATA SHEET NO. 1

(Stack Geometry)

BASE: Eielson AFB	PLANT: CH & PP
DATE: 14-20 July	SAMPLING TEAM: ECQ
SOURCE TYPE AND MAKE:	
SOURCE NUMBER: Boilers #2, #3	INSIDE STACK DIAMETER: 52.5 Inches
RELATED CAPACITY: 10	TYPE FUEL: Coal
DISTANCE FROM OUTSIDE OF NIPPLE TO INSIDE DIAMETER: 1.5 Inches	
NUMBER OF TRAVERSES: 2	NUMBER OF POINTS/TRAVERSE: 12

LOCATION OF SAMPLING POINTS ALONG TRAVERSE

POINT	PERCENT OF DIAMETER	DISTANCE FROM INSIDE WALL (Inches)	TOTAL DISTANCE FROM OUTSIDE OF NIPPLE TO SAMPLING POINT (Inches)
1			2.6
2			5.0
3			7.7
4			10.8
5			14.6
6			20.2
7			35.3
8			40.9
9			44.7
10			47.8
11			50.5
12			52.9

OEHL [illegible] 15

PRELIMINARY SURVEY DATA SHEET NO. 2

(Velocity and Temperature Traverse)

BASE: Eielson

DATE: 18 July 88

BOILER NUMBER: # 3

Pitot - .98 + 2.54

INSIDE STACK DIAMETER: 52.5 Inches

STATION PRESSURE: 29.789 In H_g

STACK STATIC PRESSURE: -1.1 In H20

SAMPLING TEAM: ECQ

TRAVERSE POINT NUMBER	VELOCITY HEAD, V_p IN H20	$\overline{V_p}$	STACK TEMPERATURE (^{0}F)
1	.99		384
2	1.30		386
3	1.60		388
4	1.80		390
5	1.85		390
6	1.85		391
7	1.80		390
8	1.80		390
9	1.70		389
10	1.10		388
11	.38		388
12	.10		388
		FPS = 84	$\overline{T}$ = 389
		$\overline{\Delta P}$ = 1.36	
AVERAGE			

OEHL FORM APR 78 16

NOZZLE CALIBRATION DATA FORM

Date 15 JULY Calibrated by GARRISON

Nozzle identification number	Nozzle Diameter[a] D_1, mm (in.)	D_2, mm (in.)	D_3, mm (in.)	ΔD,[b] mm (in.)	D_{avg}[c]
.25	0.250	0.250	0.251	0.001	0.250

where:

[a] $D_{1,2,3}$ = three different nozzles diameters, mm (in.); each diameter must be within (0.025 mm) 0.001 in.

[b] ΔD = maximum difference between any two diameters, mm (in.), $\Delta D \leq$ (0.10 mm) 0.004 in.

[c] D_{avg} = average of D_1, D_2, and D_3.

VISIBLE EMISSION OBSERVATION FORM

No.

COMPANY NAME: EIELSON AFB		
STREET ADDRESS:		
CITY	STATE: AK	ZIP
PHONE (KEY CONTACT)	SOURCE ID NUMBER: BOILER # 3	

PROCESS EQUIPMENT: COAL-FIRED BOILER	OPERATING MODE: 100,000 lb/hr
CONTROL EQUIPMENT: MULTICLONES	OPERATING MODE:

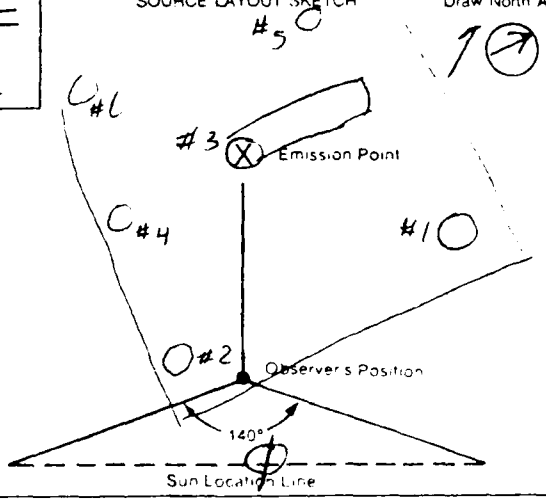
DESCRIBE EMISSION POINT: TAPERED STEEL STACK	
HEIGHT ABOVE GROUND LEVEL: 14	HEIGHT RELATIVE TO OBSERVER: Start 14 End SAME
DISTANCE FROM OBSERVER: Start 90' End SAME	DIRECTION FROM OBSERVER: Start NW End SAME

DESCRIBE EMISSIONS: VERTICAL PLUME - ALMOST INVIS.	
Start	End
EMISSION COLOR: Start LT BROWN End SAME	IF WATER DROPLET PLUME: Attached ☐ N/A Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: Start 2-5' ABOVE STACK End SAME	

DESCRIBE PLUME BACKGROUND: Start HAZY	End	
BACKGROUND COLOR: Start SKY BLUE LIGHT End SAME	SKY CONDITIONS: Start SCATTERED End SAME	
WIND SPEED: Start CALM End SAME	WIND DIRECTION: Start SE End SAME	
AMBIENT TEMP: Start 78 End SAME	WET BULB TEMP	RH percent

Stack with Plume
Sun
Wind

SOURCE LAYOUT SKETCH



Draw North Arrow

ADDITIONAL INFORMATION

OBSERVATION DATE	START TIME	END TIME
18 JULY 88	1303	1313

SEC / MIN	0	15	30	45	COMMENTS
1	5	5	5	5	PLUME ALMOST
2	5	5	5	5	NO CONSTANT ABOUT
3	5	5	5	5	30' ABOVE STACK.
4	5	5	5	5	
5	5	5	5	5	RUNS 2 & 3
6	5	5	5	5	REMAINED THE
7	5	5	5	5	SAME
8	5	5	5	5	
9	5	5	5	5	
10	5	5	5	5	
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

OBSERVER'S NAME (PRINT)

OBSERVER'S SIGNATURE | DATE

ORGANIZATION

CERTIFIED BY | DATE

CONTINUED ON VEO FORM NUMBER

VISIBLE EMISSION OBSERVATION FORM

No.

COMPANY NAME

STREET ADDRESS

CITY | STATE | ZIP

PHONE (KEY CONTACT) | SOURCE ID NUMBER: BOILER NUMBER 3

PROCESS EQUIPMENT: COAL FIRED BOILER | OPERATING MODE: 100,000 lb/hr

CONTROL EQUIPMENT: MULTICLONE | OPERATING MODE: 4" H_2O

DESCRIBE EMISSION POINT: THIRTEEN STEEL STACK

HEIGHT ABOVE GROUND LEVEL: 14 | HEIGHT RELATIVE TO OBSERVER: Start ____ End ____

DISTANCE FROM OBSERVER: Start ____ End ____ | DIRECTION FROM OBSERVER: Start ____ End ____

DESCRIBE EMISSIONS

Start ____ End ____

EMISSION COLOR | IF WATER DROPLET PLUME: Attached ____ Detached ____

Start ____ End ____

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED

Start ____ End ____

DESCRIBE PLUME BACKGROUND

Start ____ End ____

BACKGROUND COLOR | SKY CONDITIONS

Start ____ End ____ | Start ____ End ____

WIND SPEED | WIND DIRECTION

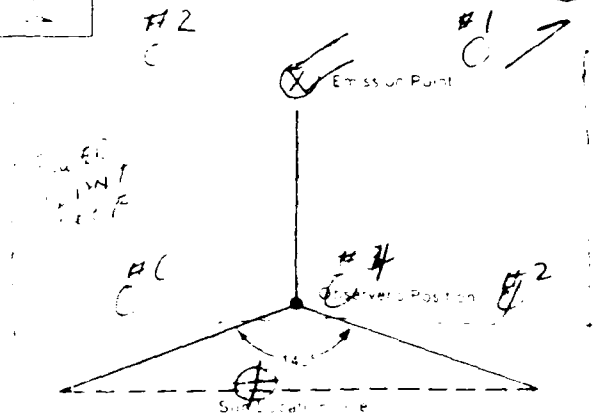
Start ____ End ____ | Start ____ End ____

AMBIENT TEMP | WET BULB TEMP ____ RH percent

Start ____ End ____

Start / Plume / Sun / Wind

SOURCE LAYOUT SKETCH — Draw North Arrow



ADDITIONAL INFORMATION

OBSERVATION DATE: 15 July 85 | START TIME: 1923 | END TIME: 1936

SEC / MIN	0	15	30	45	COMMENTS
1	5	5	5	5	SOOT BLOW
2	5	5	5	5	RUN #3
3	5	5	5	5	
4	5	5	5	5	STACK CAPACITY
5	5	5	5	5	READ FROM RECT
6	5	5	5	5	
7	5	25	45	60	
8	70	100	80	75	
9	80	10	15	5	
10	5	5	5	10	
11	15	15	15	20	
12	50	10	15	15	
13	5	5	5	5	
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

OBSERVER'S NAME (PRINT)

OBSERVER'S SIGNATURE | DATE

ORGANIZATION

CERTIFIED BY | DATE

CONTINUED ON RECORD NUMBER

EPA 5500-

APPENDIX H

Boiler 3, Field Data, 100,000 lbs/hr, 19 July 88

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ΔH@ = 2.07

PARTICULATE SAMPLING DATA SHEET

1 of 2

RUN NUMBER: one A
DATE: 19 July 88
PLANT: CHePP Boiler #1
BASE: Eielson
SAMPLE BOX NUMBER: 2010 NUTECH
METER BOX NUMBER:
Qw/Qm:
Co:

SCHEMATIC OF STACK CROSS SECTION

Pre leak ck good at 15 in wc
N
W E
S

ΔP_{STATIC} = -1.05
90,000 lb/hr

EQUATIONS

$°R = °F + 460$

$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$

WIND CALM at 09
MW 30.0 CO_2 = 10.0
ΔP_{STATIC} = -1.05 O_2 = 9.0
$\%H_2O$ 9.0
FPS = 72.0

start time 1367

AMBIENT TEMP: 82 °F
STATION PRESS: 29.628 in Hg
HEATER BOX TEMP: °F
PROBE HEATER SETTING:
PROBE LENGTH: 72 in
NOZZLE AREA (A): 0.250 sq ft
Cp: 0.84
DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H2O)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
A 1	0	-3.0	374		0.95	2.64	362.343	103		103	247	62
2	2.5	-3.5	376		1.10	3.05		102		103	247	59
3	5.0	-5.0	378		1.45	4.02		104		103	250	60
4	7.5	-5.5	381		1.60	4.42		105		104	253	61
5	10.0	-6.0	382		1.60	4.43		107		104	256	65
6	12.5	-6.5	382		1.60	4.43		108		104	256	68
7	15.0	-6.5	382		1.55	4.29		116		104	256	73
8	17.5	-7.0	382		1.60	4.45		111		105	255	78
9	20.0	-7.0	382		1.55	4.31		112		106	253	81
10	22.5	-6.0	383		0.88	2.45		115		107	254	85
11	25.0	-3.0	379		0.22	0.62		112		107	255	81
12	27.5	-3.0	379		0.25	0.70	388.714	112		107	254	81

PARTICULATE SAMPLING DATA SHEET

continued 2 of 2

RUN NUMBER: One B

DATE: 19 July 88

PLANT: CH&DP Boiler #3

BASE: Elrson

SAMPLE BOX NUMBER: 2010

METER BOX NUMBER:

Qw/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION

Post Leak ck good at 12 in Hg

90,000 #/hr

EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

stop time 1410

AMBIENT TEMP: °F

STATION PRESS: 29.628 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 72 in

NOZZLE AREA: sq ft

Cp: .84

DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
B1	0	-4.5	376		0.59	1.65	388.714	110		108	254	71
2	2.5	-5.2	378		0.74	2.07		110		108	253	71
3	5.0	-6.6	380		0.96	2.68		111		108	254	70
4	7.5	-8.0	380		1.35	3.77		112		108	254	70
5	10.0	-8.6	384		1.60	4.48		113		108	254	71
6	12.5	-9.0	381		1.60	4.48		114		109	254	72
7	15.0	-10.0	382		1.55	4.33		114		109	254	74
8	17.5	-10.0	380		1.55	4.34		114		109	250	78
9	20.0	-10.0	380		1.50	4.20		114		109	251	83
10	22.5	-10.0	381		1.45	4.06		114		109	251	86
11	25.0	-10.2	382		1.05	2.94		116		110	254	81
12	27.5	-7.0	381		0.77	2.16	415.085	116		110	254	82
		$\bar{T}_M$ = 109										
		$\bar{T}_S$ = 380										
		$\bar{\Delta H}$ = 3.37										
		$\sqrt{\Delta P_S}$ = 3.1683										
		CU FT = 52.272										

OEHL FORM 18 MAY 78

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE	DATE	RUN NUMBER
Eielson AFB	19 July 95	#1

BUILDING NUMBER	SOURCE NUMBER
6203	Boiler #3

I. PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	0.4800	.2878 ~~0.2956~~ g	0.1922
ACETONE WASH'NGS (Probe, Front Half Filter)	107.5895	107.4366	0.1529
BACK HALF (If needed)			
	Total Weight of Particulates Collected		0.3451 gm

II. WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)	138	100 mls	38
IMPINGER 2 (H20)	132 mls	100 mls	32
IMPINGER 3 (Dry)	8.4	0	8.4
IMPINGER 4 (Silica Gel)	323.9	300 g	23.9
	Total Weight of Water Collected		102.3 gm

III. GASES (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	8.6	8.4	8.6		8.5
VOL % O_2	11	11	10.8		10.9
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

OEHL FORM MAY 78 20

ΔH@ = 2.07

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: TWO A

DATE: 19 July 88

PLANT: CHPP Boiler #3

BASE: Eielson AFB

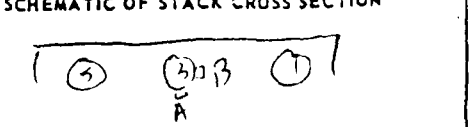
SAMPLE BOX NUMBER: 2910

METER BOX NUMBER:

Qw/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION



Pre leak ck good at 13 in Hg

90,000 lb/hr

EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

MW = 30.0

ΔP_s = -1.05

$\%H_2O$ = 9.0

Fd = 72.0

Start time 1430

AMBIENT TEMP: 82 °F

STATION PRESS: 29.628 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 72 in

NOZZLE ~~Area (A)~~ Dia: .250 in ~~sq ft~~

Cp: 0.84

DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H2O)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
A 1	0	-4.5	374		0.50	1.41	415.107	111		111	235	81
2	2.5	-6.0	378		0.69	1.99		112		111	240	75
3	5.0	-8.0	380		0.95	2.67		114		112	243	75
4	7.5	-10.0	379		1.35	3.80		115		112	245	66
5	10.0	-18.5	382		1.60	4.50		117		112	246	70
6	12.5	-19.0	384		1.55	4.37		118		113	246	75
7	15.0	-19.0	383		1.55	4.37		119		114	245	73
8	17.5	-19.0	383		1.55	4.36		118		114	247	80
9	20.0	-19.0	382		1.55	4.36		117		113	245	80
10	22.5	-19.0	381		1.45	4.08		116		113	245	80
11	25.0	-17.5	381		1.05	2.95		115		113	246	81
12	27.5	-9.0	380		0.86	2.41		112		112	246	82

OEHL FORM MAY-78 18

PARTICULATE SAMPLING DATA SHEET

(unit) 2 of 2

RUN NUMBER: TWC B

DATE: 19 July 82

PLANT: CHPP Boiler #3

BASE: Explosives HFB

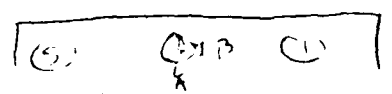
SAMPLE BOX NUMBER: 2010

METER BOX NUMBER:

Qw/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION



Post Leak check good @ 20" Hg

90, ccc W/H,

Soot blow at 1512 (point B5)

EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

stop time 1533

AMBIENT TEMP: °F

STATION PRESS: 29.628 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 72 in

NOZZLE AREA ~~(dia)~~ .25 sq ft

Cp: .84

DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
B 1	.0	9.0	378		1.00	2.81	441.100	113		112	246	73
2	2.5	-14.0	380		1.20	3.37		113		112	246	75
3	5.0	-19.0	381		1.46	3.93		114		112	246	76
4	7.5	-19.5	382		1.60	4.49		114		113	246	73
5	10.0	-20.0	379		1.55	4.35		113		111	246	67
6	12.5	-20.0	374		1.60	4.52		112		111	246	67
7	15.0	-20.0	376		1.53	4.35		114		110	246	69
8	17.5	-20.0	377		1.55	4.35		111		110	246	69
9	20.0	-19.6	378		1.50	4.20		110		109	245	67
10	22.5	-19.6	376		1.40	3.92		109		108	246	70
11	25.0	-19.6	373		0.99	2.55		107		106	246	67
12	27.5	-19.6	373		0.79	2.21	467.36	108		108	246	67
T_M = ~~###~~ 112												
T_S = 329												
$\overline{\Delta H}$ = 3.60												
$\overline{\sqrt{\Delta P}}$ = 32.470												
METER VOL = 52.259												

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE	DATE	RUN NUMBER
Eielson AFB	19 July 86	#2

BUILDING NUMBER	SOURCE NUMBER
6203	Boiler #3

I. PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	0.6370	0.2839	0.3531
ACETONE WASHINGS (Probe, Front Half Filter)	100.0338	99.6269	0.4069
BACK HALF (If needed)			
	Total Weight of Particulates Collected		.7600 gm

II. WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)	200	100 mls	100
IMPINGER 2 (H20)	60	100 mls	-40
IMPINGER 3 (Dry)	5.4	0	5.4
IMPINGER 4 (Silica Gel)	322.5	300	22.5
	Total Weight of Water Collected		87.9 gm

III. GASES (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	9.4	9.6	9.5		9.5
VOL % O_2	10	9.8	9.9		9.9
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

OEHL FORM MAY 78 20

PARTICULATE SAMPLING DATA SHEET

1 of 2

RUN NUMBER: THREE A

DATE: 19 July 88

PLANT: CHPP Boiler #3

BASE: Eielson AFB

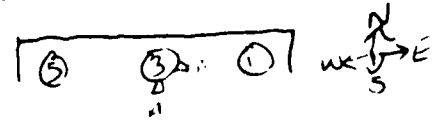
SAMPLE BOX NUMBER: 2410

METER BOX NUMBER:

Qw/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION



Pre leak chk - ok @ 19"

90,000 Btu/hr

EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

MW = 30.0 CO_2 = 10.0

ΔP_s = 1.05 O_2 = 9.0

$\%H_2O$ = 9.0

FPS = 72

start time 3:57

AMBIENT TEMP: 79 °F

STATION PRESS: 29.628 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 72 in

NOZZLE AREA (A): sq ft

Cp: 0.84

DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R) *	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R) *	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
1	0	4	375		1.1	3.07	487.570	105		106	250	85
2	2.5	4	375		1.2	3.35		107		106	251	79
3	5.0	5	372		1.5	4.21		109		106	251	72
4	7.5	5	378		1.65	4.61		110		106	252	74
5	10.0	6	380		1.7	4.74		111		106	252	78
6	12.5	6	381		1.6	4.46		112		107	252	83
7	15.0	6	381		1.55	4.33		113		107	252	82
8	17.5	6.5	381		1.55	4.33		114		108	250	82
9	20.0	6.5	381		1.55	4.33		114		108	253	81
10	22.5	6	382		1.0	2.80		115		109	256	78
11	23.0	5	380		65 / .80	1.82		115		109	250	71
12	27.5	5	378		1.66	4.63	494.143	113		108	237	67

OEHL FORM 38

PARTICULATE SAMPLING DATA SHEET

(cont) 2 of 2

RUN NUMBER: THREE B
DATE: 19 July 88
PLANT: CHPP Boiler #3
BASE: Kielson
SAMPLE BOX NUMBER: 2010
METER BOX NUMBER:
Qw/Qm:
Co:

SCHEMATIC OF STACK CROSS SECTION

Post leak chk @ 6" 11"

90,000 lb/hr

EQUATIONS

$°R = °F + 460$

$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$

Stop time 4:54

AMBIENT TEMP: 79 °F
STATION PRESS: 29.628 in Hg
HEATER BOX TEMP: °F
PROBE HEATER SETTING:
PROBE LENGTH: 72 in
NOZZLE AREA (A): sq ft
Cp: 0.84
DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
A 1	0	3.5	375		.42	1.18	494.693	110		107	251	69
2	2.5	4.5	375		.62	1.74		108		107	250	67
3	5.0	6	375		.96	2.69		109		106	251	64
4	7.5	8	376		1.4	3.91		109		106	249	65
5	10.0	8	380		1.55	4.32		110		106	242	66
6	12.5	8.5	379		1.55	4.32		110		106	249	67
7	15.0	9	380		1.55	4.32		110		106	240	69
8	17.5	9	380		1.55	4.31		109		105	249	71
9	20.0	9	380		1.45	4.03		109		105	247	67
10	22.5	9.5	378		1.4	3.90		108		105	246	66
11	25.0	7.5	379		.85	2.36		108		104	246	66
12	27.5	6	378		.38	1.06	520.066	107		104	248	68
$\bar{T}_{M2}$ =	108											
$\bar{T}_S$ =	378											
ΔH =	3.41											
$\sqrt{P_S T_S}$ =	31.4201											
CU FT =	52.496											

94

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE	DATE	RUN NUMBER
Eielson AFB	19 July 85	#3

BUILDING NUMBER	SOURCE NUMBER
6203	

I. **PARTICULATES**

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	.4823	.2853	0.1970
ACETONE WASHINGS (Probe, Front Half Filter)	98.9072	98.7231	0.1841
BACK HALF (If needed)			
	Total Weight of Particulates Collected		0.3811 gm

II. **WATER**

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)	146	100 ml/s	46.0
IMPINGER 2 (H20)	131	100 ml/s	31.0
IMPINGER 3 (Dry)	7.0	0	7.0
IMPINGER 4 (Silica Gel)	23.6	300 g	23.6
	Total Weight of Water Collected		107.6 gm

III. **GASES** (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	7.2	7.2	7.4		7.3
VOL % O_2	12	12.2	12.2		12.3
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

OEHL FORM MAY 78 20

PRELIMINARY SURVEY DATA SHEET NO. 1

(Stack Geometry)

BASE: Eielson AFB	PLANT: CH & PP
DATE: 14-20 July	SAMPLING TEAM: ECQ
SOURCE TYPE AND MAKE:	
SOURCE NUMBER: Boilers #2, #3	INSIDE STACK DIAMETER: 52.5 Inches
RELATED CAPACITY: 10	TYPE FUEL: Coal
DISTANCE FROM OUTSIDE OF NIPPLE TO INSIDE DIAMETER: 1.5 Inches	
NUMBER OF TRAVERSES: 2	NUMBER OF POINTS/TRAVERSE: 12

LOCATION OF SAMPLING POINTS ALONG TRAVERSE

POINT	PERCENT OF DIAMETER	DISTANCE FROM INSIDE WALL (Inches)	TOTAL DISTANCE FROM OUTSIDE OF NIPPLE TO SAMPLING POINT (Inches)
1			2.6
2			5.0
3			7.7
4			10.8
5			14.6
6			20.2
7			35.3
8			40.9
9			44.7
10			47.8
11			50.5
12			52.9

OEHL FORM 15 APR 76

PRELIMINARY SURVEY DATA SHEET NO. 2

(Velocity and Temperature Traverse)

BASE: Eielson AFB

DATE: 19 July 88

BOILER NUMBER: #3

INSIDE STACK DIAMETER: 52.5 Inches

STATION PRESSURE: 29.628 In Hg

STACK STATIC PRESSURE: -1.05 In H20

SAMPLING TEAM: OEHL/ECQ Garrison, Scott, Fuqua, Schilling, Davis

TRAVERSE POINT NUMBER	VELOCITY HEAD, V_p IN H20	$\overline{V_p}$	STACK TEMPERATURE (°F)
one	.78		374
two	.88		375
three	1.10		376
four	1.15		378
five	1.20		382
six	1.20		382
seven	1.20		382
eight	1.20		382
nine	1.20		382
ten	1.05		381
eleven	.84		380
twelve	.71		380
		OPERATING at 90,000	
		tot - 33	
		+ 1.2	
		FPS = 72.4	
		$\overline{\Delta P}$ = 1.04	
		$\overline{\Delta T_s}$ = 380	
		noz dia = .2364	
AVERAGE			

NOZZLE CALIBRATION DATA FORM

Date 19 ~~20~~ JULY Calibrated by GARRISON

Nozzle identification number	Nozzle Diameter[a]			ΔD,[b] mm (in.)	D_{avg}[c]
	D_1, mm (in.)	D_2, mm (in.)	D_3, mm (in.)		
0.25	0.251	0.250	0.250	0.001	0.250

where:

[a] $D_{1,2,3,}$ = three different nozzles diameters, mm (in.); each diameter must be within (0.025 mm) 0.001 in.

[b] ΔD = maximum difference between any two diameters, mm (in.) $\Delta D \leq$ (0.10 mm) 0.004 in.

[c] D_{avg} = average of D_1, D_2, and D_3.

Quality Assurance Handbook M5-2.6

VISIBLE EMISSION OBSERVATION FORM

No

COMPANY NAME: EIELSON AFB

STREET ADDRESS:

CITY: | STATE: AK | ZIP:

PHONE (KEY CONTACT): | SOURCE ID NUMBER: BOILER # 3

PROCESS EQUIPMENT: COAL-FIRED BOILER | OPERATING MODE: 90,000 LB/HR

CONTROL EQUIPMENT: MULTICLONE | OPERATING MODE:

DESCRIBE EMISSION POINT: RAPIERED STEEL STACK

HEIGHT ABOVE GROUND LEVEL: 14 | HEIGHT RELATIVE TO OBSERVER: Start 14 End

DISTANCE FROM OBSERVER: Start 90' End SAME | DIRECTION FROM OBSERVER: Start NW End SAME

DESCRIBE EMISSIONS: VERTICLE PLUME 10' ABOVE STACK

Start CUNNING End SAME

EMISSION COLOR: Start LT. BROWN End SAME | IF WATER DROPLET PLUME: Attached ☐ N/A Detached ☐

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: Start 2-5' ABOVE STACK End SAME

DESCRIBE PLUME BACKGROUND: Start HAZY End

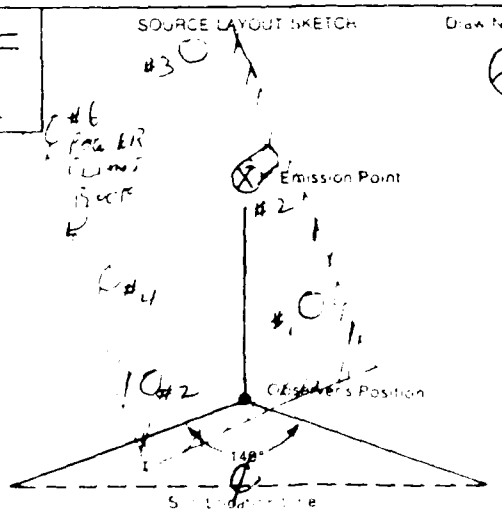
BACKGROUND COLOR: Start SKY BLUE/WHITE End SAME | SKY CONDITIONS: Start SCATTERED End

WIND SPEED: Start CALM End | WIND DIRECTION: Start VAR End

AMBIENT TEMP: Start 82 End | WET BULB TEMP: | RH percent:

SOURCE LAYOUT SKETCH — Draw North Arrow

Stack with Plume ⊂ | Sun ⊕ | Wind →



ADDITIONAL INFORMATION:

0552*

OBSERVATION DATE	START TIME	END TIME
19 JUL 88		

SEC / MIN	0	15	30	45	COMMENTS
1	5	5	5	5	OPACITY READ
2	5	5	5	5	FROM ROOF.
3	5	5	5	5	
4	5	5	5	5	PLUME ALMOST
5	5	5	5	5	INVISIBLE.
6	5	5	5	5	
7	5	5	5	5	ALL RUNS EXHIBITED
8	5	5	5	5	SAME OPACITY
9	5	5	5	5	
10	5	5	5	5	
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

OBSERVER'S NAME (PRINT):

OBSERVER'S SIGNATURE | DATE

ORGANIZATION

CERTIFIED BY | DATE

CONTINUED ON VEO FORM NUMBER

VISIBLE EMISSION OBSERVATION FORM

No.

COMPANY NAME: EIELSON AFB

STREET ADDRESS:

CITY: | STATE: AK | ZIP:

PHONE (KEY CONTACT): | SOURCE ID NUMBER: BOILER #3

PROCESS EQUIPMENT: COAL-FIRED BOILER | OPERATING MODE: 90,000 lb/hr

CONTROL EQUIPMENT: MULTICLONE | OPERATING MODE:

DESCRIBE EMISSION POINT:

HEIGHT ABOVE GROUND LEVEL: 14' | HEIGHT RELATIVE TO OBSERVER: Start 14' End SAME

DISTANCE FROM OBSERVER: Start 90' End SAME | DIRECTION FROM OBSERVER: Start NW End SAME

DESCRIBE EMISSIONS: VERTICLE PLUME 5' ABOVE STACK

Start CONTINUING | End

EMISSION COLOR: Start LT BROWN End SAME | IF WATER DROPLET PLUME: Attached N/A Detached

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: Start 2-5' ABOVE STACK End SAME

DESCRIBE PLUME BACKGROUND: Start HAZY | End

BACKGROUND COLOR: Start | End | SKY CONDITIONS: Start | End

WIND SPEED: Start CALM End | WIND DIRECTION: Start VAR End

AMBIENT TEMP: Start | End | WET BULB TEMP | RH percent

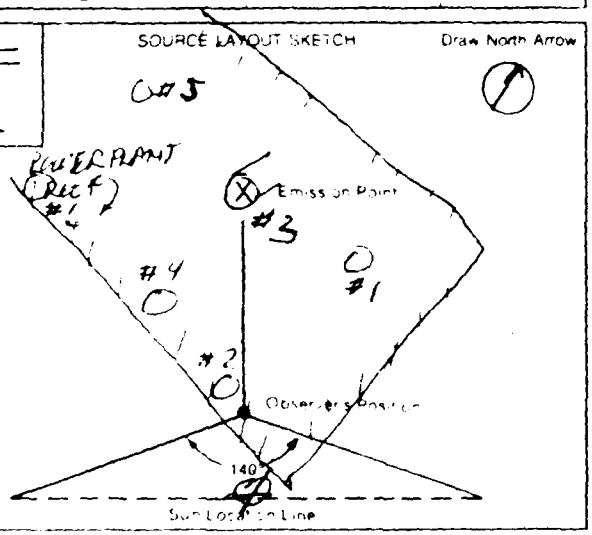
SOURCE LAYOUT SKETCH

Draw North Arrow

Stack with Plume

Sun

Wind



ADDITIONAL INFORMATION:

OBSERVATION DATE	START TIME	END TIME
19 JULY 88		

SEC / MIN	0	15	30	45	COMMENTS
1	5	5	5	5	SOOT BLOW
2	10	5	5	5	RUN #2
3	5	5	5	5	
4	5	5	5	5	
5	10	15	25	45	
6	40	30	5	5	
7	5	5	40	40	
8	70	75	60	15	
9	10	5	5	5	
10	5	5	5	5	
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

OBSERVER'S NAME (PRINT):

OBSERVER'S SIGNATURE | DATE

ORGANIZATION

CERTIFIED BY | DATE

CONTINUED ON VEO FORM NUMBER

APPENDIX I

Boiler 3, Field Data, 100,000, 20 July 88

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Run #3

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: #1 A

DATE: 26 Jul 88

PLANT:

BASE: Lisbon

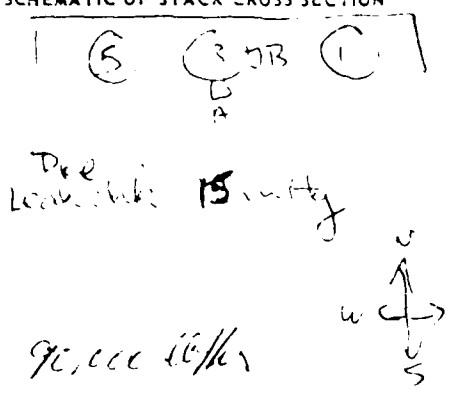
SAMPLE BOX NUMBER: 2C

METER BOX NUMBER:

Y: Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION



EQUATIONS

$^{\circ}R = {}^{\circ}F + 460$

$$H = \left[\frac{5130 \cdot F_d \cdot C_p \cdot A}{C_o}\right]^2 \cdot \frac{T_m}{T_s} \cdot V_p$$

Pbar = 29.1

Pmeter = - 5.00
+ 2.20

Start clock @ 1125 (pt #5)

TIME 1112

AMBIENT TEMP: 70 °F

STATION PRESS: 29.45 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 72 in

NOZZLE AREA (A): .250 sq ft

Cp: .84

DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H2O)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
A 1	0	-3.4	371		0.52	1.42	520.225	84		91	243	72
2	2.5	-3.4	374		0.64	1.75		93		92	244	74
3	5.0	-4.4	374		0.90	2.45		96		92	245	66
4	7.5	-5.5	374		1.3	3.57		98		94	246	67
5	10.0	-5.5	372		1.4	3.81		103		94	247	69
6	12.5	-6.4	374		1.4	3.81		104		95	247	66
7	15.0	-6.4	374		1.4	3.83		107		97	245	69
8	17.5	-6.4	374		1.4	3.84		108		98	243	71
9	20.0	-6.4	372		1.3	3.63		106		96	245	74
10	22.5	-5.5	374		1.25	3.48		108		99	247	69
11	25.0	-6.4	373		0.95	2.66		112		99	249	79
12	27.5	-5.5	374		0.72	2.01		111		101	254	78

OEHL FORM MAY 78 18

103

0552

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: A1 B

DATE: 2/ 1 ..82

PLANT: C...

BASE: ...

SAMPLE BOX NUMBER:

METER BOX NUMBER:

Qa/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION

D... ... at 15 in Hg

... (...)

EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

start time 1215 L

AMBIENT TEMP: 71 °F

STATION PRESS: 29.745 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 72 in

NOZZLE AREA (A): .95 sq ft

Cp: .84

DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
B1	[illegible]	[illegible]	320		0.77	2.70	545.095	110		107	250	64
2	[illegible]	[illegible]	321		1.10	3.91		118		107	254	65
3	[illegible]	[illegible]	324		1.40	3.73		110		102	249	67
4	[illegible]	[illegible]	324		1.54	4.21		112		104	251	68
5	[illegible]	[illegible]	325		1.5	4.21		112		105	254	69
6	[illegible]	[illegible]	327		1.5	4.26		113		105	252	69
7	[illegible]	[illegible]	322		1.4	3.94		113		105	252	69
8	[illegible]	[illegible]	321		1.4	3.93		112		105	251	69
9	[illegible]	[illegible]	320		1.45	4.07		112		105	250	66
10	[illegible]	[illegible]	324		1.16	3.89		112		105	254	67
11	[illegible]	[illegible]	323		0.61	1.72		112		106	254	69
12	[illegible]	[illegible]	311		0.36	1.02	570.494	113		106	254	64
Tm = 104												
Ts = 323												
$\overline{\Delta H}$ = 3.19												
$\overline{\sqrt{\Delta H}}$ = 30.4430												
VOL = 49.889												

OEHL FORM MAY '78 18

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE	DATE	RUN NUMBER
Eielson	20 July 88	one

BUILDING NUMBER	SOURCE NUMBER
CH&PP.	Boiler #3

I. PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	Ø.4496	Ø.2871	Ø.1625
ACETONE WASHINGS (Probe, Front Half Filter)	107.6835	107.4366	Ø.1969
BACK HALF (If needed)			
	Total Weight of Particulates Collected		.3594 gm

II. WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)	174	100	74.Ø
IMPINGER 2 (H20)	129	100	29.Ø
IMPINGER 3 (Dry)	3.2		3,2
IMPINGER 4 (Silica Gel)	311.7	300	11.7
	417.9 Total Weight of Water Collected		117.9 gm

III. GASES (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	9.6	9.6	9.8		9.7
VOL % O_2	9.4	9.2	9.2		9.3
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

OEHL FORM 20 MAY 78

US 0552 GOVT COPIES

Boiler 3

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: # 2

DATE: 20 July 82

PLANT: C + D

BASE: Nelson

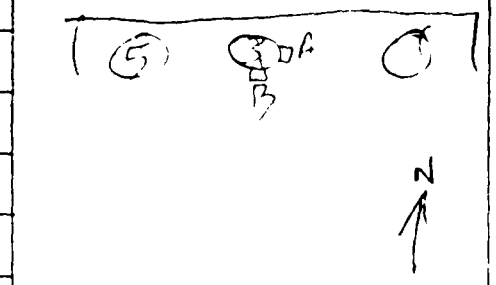
SAMPLE BOX NUMBER: 2010

METER BOX NUMBER:

Qw/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION



Pre Leak check at 15 in Hg

70,000 lb/hr

EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

w

%H.O 9
%CO2 9
%O2 8
Ps 27.1
Leak 0.07

start time 1237

AMBIENT TEMP: °F

STATION PRESS: 29.238 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: in

NOZZLE AREA (A): .25 sq ft

Cp: .84

DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
A 1	0	-7.8	374		0.87	2.44	571.240	106		104	242	74
2	2.5	-9.6	372		1.16	3.68		106		104	246	76
3	5.0	-13.8	372		1.35	3.75		101		102	248	69
4	7.5	-17.4	374		1.41	3.91		108		104	251	78
5	10.0	-17.6	374		1.45	4.04		109		104	252	81
6	12.5	-17.4	373		1.46	3.92		110		104	252	83
1	15.0	-14.4	374		1.35	3.76		107		104	254	79
2	17.5	-18.4	374		1.4	3.93		111		106	255	83
3	20.0	-19.8	374		1.4	3.94		112		108	254	82
4	22.5	-16.4	374		1.2	3.35		106		104	250	83
5	25.0	-8.4	374		0.76	1.95		106		104	254	82
6	27.5	-8.0	373		0.62	1.73		106		104	251	81

106

OEHL FORM 18 MAY 78

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: #2 B
DATE: 20 July 84
PLANT: CEDP
BASE: Kelson
SAMPLE BOX NUMBER: 1016
METER BOX NUMBER:
Qw/Qm:
Co:

SCHEMATIC OF STACK CROSS SECTION

Post hole at 22 in/ft

90,000 lb/hr

EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

STD TIME 1338

AMBIENT TEMP: 70 °F
STATION PRESS: 29.238 in Hg
HEATER BOX TEMP: °F
PROBE HEATER SETTING:
PROBE LENGTH: 72 in
NOZZLE AREA (A): .25 sq ft
Cp: .84
DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
B 1	0	-6.5	370		0.48	1.35	537.407	106		104	250	74
2	2.5	-8.0	371		0.69	1.93		106		104	250	71
3	5.0	-8.0	373		0.92	2.57		107		104	251	72
4	7.5	-13.0	374		1.15	3.21		108		104	246	72
5	10.0	-10.0	376		1.35	3.77		110		105	246	71
6	12.5	-12.0	375		1.35	3.75		111		106	241	73
7	15.0	-11.5	374		1.34	3.63		111		106	240	78
8	17.5	-11.5	375		1.30	3.65		111		107	247	79
9	20.0	-10.5	375		1.3	3.65		111		108	247	77
10	22.5	-10.5	374		1.2	3.37		111		108	247	80
11	25.0	-12.5	374		0.84	2.36		111		106	249	75
12	27.5		374		0.69	1.94	622.015	111		108	249	76

$T_M = 107$
$T_S = 373$
$\Delta H = 3.13$
$\sqrt{\Delta P}\,T_S = 30.1997$
$VOL = 50.775$

OEHL FORM 18

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE	DATE	RUN NUMBER
Eielson AFB	20 July 88	TWO

BUILDING NUMBER	SOURCE NUMBER
CH&PP	Boiler #3

I. PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	0.4456	.2951	.1605
ACETONE WASHINGS (Probe, Front Half Filter)	99.7448	99.6269	.1229
BACK HALF (If needed)			
	Total Weight of Particulates Collected		.2834 gm

II. WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)	152	100	52.0
IMPINGER 2 (H20)	120	100	20.0
IMPINGER 3 (Dry)	7.5	0	7.5
IMPINGER 4 (Silica Gel)	336.1	300	36.1
	115.6 Total Weight of Water Collected		115.6 gm

III. GASES (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	10.2	[illegible]	10.2		10.3
VOL % O_2	9.0	[illegible]	9.0		8.9
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

OEHL FORM 20 MAY 78

0552e

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: #3 A

DATE: 20 July 88

PLANT: Riedsville

BASE: CMPD

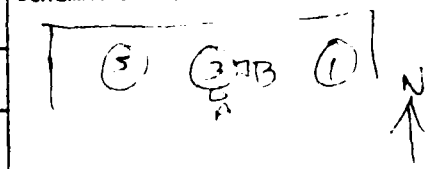
SAMPLE BOX NUMBER: 2C10

METER BOX NUMBER:

Qw/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION



Pre Leak Check @ 19 in

90,000 lb/hr

EQUATIONS

$°R = °F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

$\Delta H_2 O$

$C O_2$

$P_s = 29.1$

$\Delta H_a = 2.0$

$N_2 = 30$

START TIME 1400

AMBIENT TEMP: 72 °F

STATION PRESS: 29.230 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 72 in

NOZZLE AREA (A): .25 sq ft

Cp: .84

DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H2O)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
A 1	0	-3.4	378		0.52	1.46	622.250	116		106	232	66
2	5.5	-3.0	371		0.68	1.91		116		106	234	67
3	5.0	-3.6	374		0.78	2.18		118		106	233	59
4	2.5	-4.4	373		1.24	3.36		120		106	240	68
5	10.0	-5.5	374		1.40	3.94		111		107	241	57
6	12.5	-6.4	376		1.46	3.91		113		108	242	64
7	15.0	-6.4	375		1.36	3.65		117		107	241	68
8	17.5	-6.4	375		1.36	3.66		119		108	241	61
9	20.0	-6.4	371		1.30	3.67		115		107	242	59
10	22.5	-6.6	370		1.20	3.46		113		108	242	60
11	25.0	-6.6	371		0.36	1.43		113		108	240	59
12	27.5	-3.8	372		0.67	1.89		113		108	245	62

OEHI FORM 19

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: 153

DATE:

PLANT:

BASE:

SAMPLE BOX NUMBER:

METER BOX NUMBER:

Qw/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION

EQUATIONS

$^{\circ}R = {}^{\circ}F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

AMBIENT TEMP: 71 °F

STATION PRESS: in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: 72 in

NOZZLE AREA (A): sq ft

Cp: .821

DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H2O)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
1	0	-5.5	372		0.95	2.66	646.728	111		102	245	60
2	2.5	-6.4	372		1.05	2.96		111		108	247	60
3	5.0	-7.4	375		1.25	3.50		112		108	248	60
4	7.5	-8.6	373		1.45	4.08		113		108	249	59
5	10.0	-8.4	373		1.45	4.08		113		108	249	59
6	12.5	-8.2	372		1.40	3.94		113		108	247	59
7	15.0	-8.0	371		1.30	3.66		113		108	249	60
8	17.5	-8.0	371		1.35	3.81		112		108	246	61
9	20.0	-8.0	371		1.35	3.81		113		108	248	64
10	22.5	-8.0	374		1.45	4.08		113		108	248	64
11	25.0	-7.5	371		1.34	3.77		113		108	248	65
12	27.5	-7.4	371		1.25	3.52	673.500	112		108	248	66

TM = 110

TS = 372

$\overline{\Delta H}$ = 3.19

$\overline{\sqrt{\Delta P}}$ = 30.4123

VOL = 51.255

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE	DATE	RUN NUMBER
Eielson	20 July 88	THREE

BUILDING NUMBER	SOURCE NUMBER
CH & PP.	Boiler #3

I. PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	0.4883	.2858	.2025
ACETONE WASHINGS (Probe, Front Half Filter)	98.9511	98.7231	.2280
BACK HALF (If needed)			
	Total Weight of Particulates Collected		.4305 gm

II. WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)	122		25.0
IMPINGER 2 (H20)	172		72.0
IMPINGER 3 (Dry)	4.6		4.6
IMPINGER 4 (Silica Gel)	316		16.0
	Total Weight of Water Collected		114.6 gm

III. GASES (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	1.2	1.4			
VOL % O_2	1.2	1.4			
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

OEHL FORM 20 MAY 78

US 0552 GOVT COPIER

PRELIMINARY SURVEY DATA SHEET N 1

(Stack Geometry)

BASE: Eielson AFB	PLANT: CH & PP
DATE: 14-20 July	SAMPLING TEAM: ECQ
SOURCE TYPE AND NAME:	
SOURCE NUMBER: Boilers #2, #3	INSIDE STACK DIAMETER: 52.5 Inches
RELATED CAPACITY: 10	TYPE FUEL: Coal
DISTANCE FROM OUTSIDE OF NIPPLE TO INSIDE DIAMETER: 1.5 Inches	
NUMBER OF TRAVERSES: 2	NUMBER OF POINTS/TRAVERSE: 12

LOCATION OF SAMPLING POINTS ALONG TRAVERSE

POINT	PERCENT OF DIAMETER	DISTANCE FROM INSIDE WALL (Inches)	TOTAL DISTANCE FROM OUTSIDE OF NIPPLE TO SAMPLING POINT (Inches)
1			2.6
2			5.0
3			7.7
4			10.8
5			14.6
6			20.2
7			35.3
8			40.9
9			44.7
10			47.8
11			50.5
12			52.9

OEHL [illegible] 15

PRELIMINARY SURVEY DATA SHEET NO. 2

(Velocity and Temperature Traverse)

BASE: Eielson AFB

DATE: 22 July 82

BOILER NUMBER: Boiler # 3

INSIDE STACK DIAMETER: 52.5 Inches

STATION PRESSURE: 29.245 In Hg

STACK STATIC PRESSURE: -1.1 In H20

SAMPLING TEAM: ECQ Air Function

TRAVERSE POINT NUMBER	VELOCITY HEAD, V_p IN H20	cyclonic flow θ	STACK TEMPERATURE (°F)
1	~~0.45~~ 0.52	4°	370
2	0.59	¢	371
3	0.83	¢	371
4	1.2	¢	372
5	1.4	¢	375
6	1.4	¢	377
7	1.3	¢	377
8	1.2	¢	377
9	1.2	¢	377
10	1.1	¢	377
11	0.87	¢	377
12	0.77	¢	376
		$\bar{\theta}$ = 1.25°	
	F_{FS} = 72		
	$\bar{\Delta P}$ = 1.03		
	$\bar{T}_s$ = 375		
	rms .237		
AVERAGE			

US 0552+

OEHL FORM 16

NOZZLE CALIBRATION DATA FORM

Date 20 Jul 88 Calibrated by [illegible]

Nozzle identification number	Nozzle Diameter[a]			ΔD,[b] mm (in.)	D_{avg}[c]
	D_1, mm (in.)	D_2, mm (in.)	D_3, mm (in.)		
.250	.250	.250	.251	.001	.250

where:

[a] $D_{1,2,3,}$ = three different nozzles diameters, mm (in.); each diameter must be within (0.025 mm) 0.001 in.

[b] ΔD = maximum difference between any two diameters, mm (in.), $\Delta D \leq$ (0.10 mm) 0.004 in.

[c] D_{avg} = average of D_1, D_2, and D_3.

Quality Assurance Handbook Mb-2.6

VISIBLE EMISSION OBSERVATION FORM

No.

COMPANY NAME: KIELSON		
STREET ADDRESS:		
CITY	STATE: AK	ZIP
PHONE (KEY CONTACT)	SOURCE ID NUMBER: BOILER # 3	

PROCESS EQUIPMENT: COAL-FIRED BOILER	OPERATING MODE: 90,000 lb/hr
CONTROL EQUIPMENT: MULTICLONE	OPERATING MODE: 3" H2O

DESCRIBE EMISSION POINT:

HEIGHT ABOVE ~~GROUND~~ ROOF LEVEL: 14	HEIGHT RELATIVE TO OBSERVER: Start 14 End
DISTANCE FROM OBSERVER: Start 90 End SAME	DIRECTION FROM OBSERVER: Start W End

DESCRIBE EMISSIONS: WISP - ALMOST BARELY VISIBLE
Start CONTINUOUS End SAME

EMISSION COLOR: Start LT BROWN End SAME	IF WATER DROPLET PLUME: Attached: N/A Detached

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: Start 4' ABOVE STACK End SAME

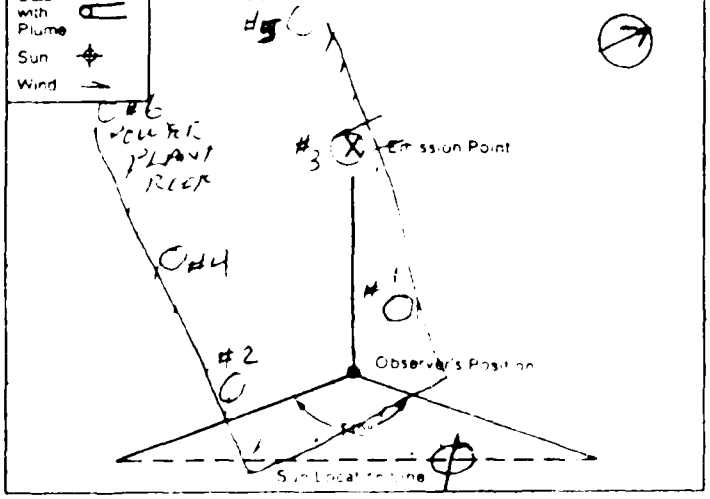
DESCRIBE PLUME BACKGROUND: Start HAZY End SAME

BACKGROUND COLOR: Start SKY BLUE WHITE End SAME	SKY CONDITIONS: Start SCATTERED End SAME
WIND SPEED: Start CALM End SAME	WIND DIRECTION: Start LIGHT End
AMBIENT TEMP: Start 75 End SAME	WET BULB TEMP / RH percent

SOURCE LAYOUT SKETCH

Stack with Plume
Sun
Wind

Draw North Arrow



OBSERVATION DATE	START TIME	END TIME
20 JULY 88	~~1025~~ 1112	

SEC / MIN	0	15	30	45	COMMENTS
1	5	5	5	5	RUN # 1
2	5	5	5	5	INCL DEVSCOT
3	5	5	5	5	BLDG
4	5	5	5	5	
5	5	5	5	5	
6	5	5	5	5	
7	5	5	5	5	
8	5	5	5	5	
9	5	5	5	5	
10	5	5	5	5	
11	5	5	5	5	
12	5	5	5	5	
13	5	5	5	5	
14	5	15	30	35	SALT BLDG
15	35	30	25	30	
16	35	35	20	5	
17	5	5	5	5	
18					
19					MULTICLONE FAILED
20					THE SAME DAY
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

ADDITIONAL INFORMATION:

OBSERVER'S NAME (PRINT)

OBSERVER'S SIGNATURE | DATE

ORGANIZATION

CERTIFIED BY | DATE

CONTINUATION FORM NUMBER

0552o

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APPENDIX J

Acetone Blank Results and Emissions Calculations

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ACETONE BLANK ANALYTICAL DATA FORM

Plant: CENTRAL HEAT + POWER PLANT

Location: EIELSON AFB

Date of analysis: 20 JULY 88

Density of acetone(p_a): 0.79 g/ml

Acetone blank volume(V_a): 200 ml

Acetone wash volume(V_{aw}): 400 ml *

Average gross wt: 95303.2 mg

Tare wt: 95302.1 mg

Weight of blank(m_{ab}): 1.1 mg

Acetone blank residue concentration(C_a):

$$C_a = \frac{m_{ab}}{V_a \times p_a} = \frac{1.1}{(200)(0.79)} = 0.0070 \text{ mg/g}$$

Weight of residue in acetone wash(W_a):

$$W_a = C_a \times V_{aw} \times p_a = (0.007)(400)(0.79) = 2.2 \text{ mg}$$ **

* ALL ACETONE WASH SAMPLES BROUGHT UP TO 400 ml

** RESIDUE IN WASH SAMPLES INSIGNIFICANT IN EMISSION CALCULATIONS, THEREFORE NOT SUBTRACTED FROM FRONT HALF CATCH.

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE	DATE	RUN NUMBER
FIELSCH AFB	20 JULY 83	N/A

BUILDING NUMBER	SOURCE NUMBER
CH #17	2ND FLOOR HEATING BOILER

I. PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	N/A		→
ACETONE WASHINGS (Probe, Front Half Filter) BLANK	95.3032	95.3021	0.0011
BACK HALF (If needed)			
	Total Weight of Particulates Collected		0.0011 gm

II. WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)			
IMPINGER 2 (H20)			
IMPINGER 3 (Dry)			
IMPINGER 4 (Silica Gel)			
	Total Weight of Water Collected		gm

III. GASES (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2					
VOL % O_2					
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

AMD FORM FEB 84 651 REPLACES OEHL 20, MAY 78, WHICH IS OBSOLETE

BOILER 2, 14 JULY

```
          XROM "METH 5"
RUN NUMBER
B2 R1 14 JULY
                        RUN
METER BOX Y?
          1.0770    RUN
DELTA H?
          3.7000    RUN
BAR PRESS ?
         29.2350    RUN
METER VOL ?
         53.2770    RUN
MTR TEMP F?
         98.0000    RUN
% OTHER GAS
REMOVED BEFORE
DRY GAS METER ?
.                       RUN
STATIC H2O IN ?
         -1.4500    RUN
STACK TEMP.
        412.0000    RUN
ML. WATER ?
        255.3000    RUN
IMP. % H2O = 16.3

% H2O=16.3


% CO2?
         13.6000    RUN
% OXYGEN?
          5.9000    RUN
% CO ?
                    RUN
MOL WT OTHER?
                    RUN

MWd =30.41
MW WET=26.14


SQRT PSTS ?
         32.8600    RUN
TIME MIN ?
         60.0000    RUN
NOZZLE DIA ?
           .2520    RUN
STK DIA INCH ?
         52.5000    RUN

* VOL MTR STD = 53.545
  STK PRES ABS = 29.13
  VOL H2O GAS = 12.80
  % MOISTURE = 16.33
  MOL DRY GAS = 6.817
  % NITROGEN = 80.59
  MOL WT DRY = 30.41
  MOL WT WET = 26.14
  VELOCITY FPS = 62.43
  STACK AREA = 15.03
  STACK ACFM = 74,347.
* STACK DSCFM = 35,793.
  % ISOKINETIC =  100.38
```

```
          XROM "MASSFLO"
RUN NUMBER
B2 R1 14 JULY
                        RUN

VOL MTR STD ?
          53.545    RUN
STACK DSCFM ?
       35,793.00    RUN
FRONT 1/2 MG ?
          534.70    RUN
BACK 1/2 MG ?
                    RUN


F  GR/DSCF = 0.15
F  MG/MMM = 352.65
F  LB/HR = 47.28
F  KG/HR = 21.45
```

BOILER 3, 17JULY

```
        XROM "METH 5"
RUN NUMBER
B3 R1  17 July
                    RUN
METER BOX Y?
          1.0000    RUN
DELTA H?
          3.8900    RUN
BAR PRESS ?
         29.6200    RUN
METER VOL ?
         56.3230    RUN
NTP TEMP F?
         97.0000    RUN
% OTHER GAS
REMOVED BEFORE
DRY GAS METER ?
                    RUN
STATIC MOM IN ?
         -1.9000    RUN
STACK TEMP.
        361.0000    RUN
ML. WATER ?
        161.0000    RUN
INF. % MOM = 11.7

% MOM=11.7


% CO2?
         10.6000    RUN
% OXYGEN?
          8.0000    RUN
% CO ?
                    RUN
MOL WT OTHER?
                    RUN

MWd =30.05
MW WET=28.64


SQRT PSTS ?
         33.8055    RUN
TIME MIN ?
         60.0000    RUN
NOZZLE DIA ?
          .2540    RUN
STK DIA INCH ?
         50.5000    RUN

* VOL NTP STI = 57.63
  STK PRES AB = 29.4
  VOL MOM GM = 3.6
  % MOISTURE = 11.6
  MOL DRY GAS = 0.89
  % NITROGEN = 80.6
  MOL WT DR = 30.05
  MOL WT WET = 28.64
  VELOCITY FPS = 97.55
  STACK AREA = 15.87
  STACK ACFM = 75.75
* STACK DSCFM = 42.17
  % ISOKINETIC = 90.77
```

```
        XROM "MASSFLO"
RUN NUMBER
B3 R1  17 July
                    RUN

VOL NTP STI ?
         57.6350    RUN
STACK DSCFM ?
      42 173.0000   RUN
FROM 1/2 NO ?
         760.0000   RUN
BACK 1/2 NO ?
                    RUN


F  GR DSCF = 0.207
F  NO/MMP = 465.6657
F  LB/HR = 73.5500
F  KG/HR = 33.3655
```

```
        XROM "MASSFLO"
RUN NUMBER
B3 R1  17 July
                    RUN

VOL NTP STI ?
         31.0990    RUN
STACK DSCFM ?
      42 979.0000   RUN
FROM 1/2 NO ?
         257.0000   RUN
BACK 1/2 NO ?
                    RUN


F  GR DSCF = 0.1474
F  NO/MMP = 331.2647
F  LB/HR = 54.1443
F  KG/HR = 24.6051
```

```
        XROM "METH 5"
RUN NUMBER
B3 R2  17 July
                    RUN
METER BOX Y?
          1.0000    RUN
DELTA H?
           .5200    RUN
BAR PRESS ?
         29.6200    RUN
METER VOL ?
         30.0390    RUN
NTP TEMP F?
         84.0000    RUN
% OTHER GAS
REMOVED BEFORE
DRY GAS METER ?
                    RUN
STATIC MOM IN ?
         -1.9000    RUN
STACK TEMP.
        363.0000    RUN
ML. WATER ?
         71.7000    RUN
INF. % MOM = 9.8

% MOM=9.8


% CO2?
         10.6000    RUN
% OXYGEN?
          8.4000    RUN
% CO ?
                    RUN
MOL WT OTHER?
                    RUN

MWd =30.07
MW WET=28.85


SQRT PSTS ?
         33.9057    RUN
TIME MIN ?
         72.0000    RUN
NOZZLE DIA ?
          .1550    RUN
STK DIA INCH ?
         50.5000    RUN

* VOL NTP STI = 31.09
  STK PRES AB = 29.4
  VOL MOM GM = 3.77
  % MOISTURE = 9.7
  MOL DRY GAS = 0.90
  % NITROGEN = 81.0
  MOL WT DRY = 30.07
  MOL WT WET = 28.85
  VELOCITY FPS = 82.4
  STACK AREA = 15.87
  STACK ACFM = 75.36
* STACK DSCFM = 42.97
  % ISOKINETIC = 115.4
```

```
        XROM "METH 5"
RUN NUMBER
B3 R3  17 July
                    RUN
METER BOX Y?
          1.0000    RUN
DELTA H?
           .4900    RUN
BAR PRESS ?
         29.6200    RUN
METER VOL ?
         33.3140    RUN
NTP TEMP F?
         86.0000    RUN
% OTHER GAS
REMOVED BEFORE
DRY GAS METER ?
                    RUN
STATIC MOM IN ?
         -1.9000    RUN
STACK TEMP.
        377.0000    RUN
ML. WATER ?
         83.6000    RUN
INF. % MOM = 10.6

% MOM=10.6


% CO2?
         10.6000    RUN
% OXYGEN?
          8.4000    RUN
% CO ?
                    RUN
MOL WT OTHER?
                    RUN

MWd =30.02
MW WET=28.72


SQRT PSTS ?
         33.2150    RUN
TIME MIN ?
         84.0000    RUN
NOZZLE DIA ?
          .1550    RUN
STK DIA INCH ?
         50.5000    RUN

* VOL NTP STI = 32.32
  STK PRES AB = 29.4
  VOL MOM GM = 3.94
  % MOISTURE = 10.5
  MOL DRY GAS = 0.894
  % NITROGEN = 81.0
  MOL WT DRY = 30.07
  MOL WT WET = 28.7
  VELOCITY FPS = 81.5
  STACK AREA = 15.87
  STACK ACFM = 73.88
* STACK DSCFM = 41.874
  % ISOKINETIC = 116.9
```

```
        XROM "MASSFLO"
RUN NUMBER
B3 R3  17 July
                    RUN

VOL NTP STI ?
         32.3290    RUN
STACK DSCFM ?
      41.874.0000   RUN
FROM 1/2 NO ?
         381.5000   RUN
BACK 1/2 NO ?
                    RUN


F  GR/DSCF = 0.1794
F  NO/MMP = 319.4547
F  LB/HR = 49.1455
F  KG/HR = 22.2936
```

BOILER 3, 18 JULY

```
        XROM "METH 5"
RUN NUMBER
B3 R1  18 July
                    RUN
METER BOX Y?
          1.0770    RUN
DELTA H?
          3.7300    RUN
BAR PRESS ?
         29.7890    RUN
METER VOL ?
         54.2510    RUN
MTR TEMP F?
        103.0000    RUN
% OTHER GAS
REMOVED BEFORE
DRY GAS METER ?
                    RUN
STATIC H2O IN ?
         -1.1000    RUN
STACK TEMP.
        387.2000    RUN
ML. WATER ?
        118.2000    RUN
INF. % H2O = 9.2

% H2O=9.2


% CO2?
          9.0000    RUN
% OXYGEN?
          9.6000    RUN
% CO ?
                    RUN
MOL WT OTHER?
                    RUN

MWd =29.82
MW WET=28.74


SQRT PSTS ?
         34.0274    RUN
TIME MIN ?
         60.0000    RUN
NOZZLE DIA ?
           .2500    RUN
STK DIA INCH ?
         52.5000    RUN

* VOL MTR STD = 55.059
  STK PRES ABS = 29.71
  VOL H2O GAS = 5.56
  % MOISTURE = 9.19
  MOL DRY GAS = 0.909
  % NITROGEN = 81.49
  MOL WT DRY = 29.91
  MOL WT WET = 28.74
  VELOCITY FPS = 87.67
  STACK AREA = 15.03
  STACK ACFM = 79 471.
* STACK DSCFM = 42 394.
  % ISOKINETIC =  95.51
```

```
        XROM "MASSFLO"
RUN NUMBER
B3 R1 18 JULY
                    RUN

VOL MTR STD ?
         55.059     RUN
STACK DSCFM ?
        42.394.00   RUN
FRONT 1/2 MG ?
          500.66    RUN
BACK 1/2 MG ?
            0.00    RUN


F  GR/DSCF = 0.16
F  MG/MMF = 372.79
F  LB/HR = 59.13
F  KG/HR = 26.82
```

```
        XROM "MASSFLO"
RUN NUMBER
B3 R2 18 JULY
                    RUN

VOL MTR STD ?
         50.16      RUN
STACK DSCFM ?
        39 394.00   RUN
FRONT 1 2 MG ?
          467.30    RUN
BACK 1-2 MG ?
            0.00    RUN


F  GR DSCF = 0.14
F  MG/MMM = 323.99
F  LB/HR = 48.55
F  KG HR = 22.02
```

```
        XROM "METH 5"
RUN NUMBER
B3 R2  18 July
                    RUN
METER BOX Y?
          1.0770    RUN
DELTA H?
          3.4200    RUN
BAR PRESS ?
         29.7890    RUN
METER VOL ?
         49.5500    RUN
MTR TEMP F?
        104.0000    RUN
% OTHER GAS
REMOVED BEFORE
DRY GAS METER ?
                    RUN
STATIC H2O IN ?
         -1.1000    RUN
STACK TEMP.
        386.0000    RUN
ML. WATER ?
        117.4000    RUN
INF. % H2O = 9.9

% H2O=9.9


% CO2?
         10.0000    RUN
% OXYGEN?
          9.4000    RUN
% CO ?
                    RUN
MOL WT OTHER?
                    RUN

MWd =29.98
MW WET=28.79


SQRT PSTS ?
         31.8630    RUN
TIME MIN ?
         60.0000    RUN
NOZZLE DIA ?
           .2500    RUN
STK DIA INCH ?
         52.5000    RUN

* VOL MTR STD = 50.160
  STK PRES ABS = 29.71
  VOL H2O GAS = 5.53
  % MOISTURE = 9.92
  MOL DRY GAS = 0.901
  % NITROGEN = 80.66
  MOL WT DRY = 29.95
  MOL WT WET = 28.79
  VELOCITY FPS = 78.24
  STACK AREA = 15.03
  STACK ACFM = 70 573.
* STACK DSCFM = 39 394.
  % ISOKINETIC =  92.64
```

```
        XROM "METH 5"
RUN NUMBER
B3 R3  18 July
                    RUN
METER BOX Y?
          1.0770    RUN
DELTA H?
          3.7400    RUN
BAR PRESS ?
         29.7890    RUN
METER VOL ?
         53.7120    RUN
MTR TEMP F?
        106.0000    RUN
% OTHER GAS
REMOVED BEFORE
DRY GAS METER ?
                    RUN
STATIC H2O IN ?
         -1.1000    RUN
STACK TEMP.
        384.0000    RUN
ML. WATER ?
        129.4000    RUN
INF. % H2O = 10.1

% H2O=10.1


% CO2?
         10.1000    RUN
% OXYGEN?
          9.5000    RUN
% CO ?
                    RUN
MOL WT OTHER?
                    RUN

MWd =30.00
MW WET=28.78


SQRT PSTS ?
         33.8816    RUN
TIME MIN ?
         60.0000    RUN
NOZZLE DIA ?
           .2500    RUN
STK DIA INCH ?
         52.5000    RUN

* VOL MTR STD = 54.224
  STK PRES ABS = 29.71
  VOL H2O GAS = 6.09
  % MOISTURE = 10.10
  MOL DRY GAS = 0.899
  % NITROGEN = 80.49
  MOL WT DRY = 30.00
  MOL WT WET = 28.78
  VELOCITY FPS = 83.01
  STACK AREA = 15.03
  STACK ACFM = 74 871.
* STACK DSCFM = 41 810.
  % ISOKINETIC =  95.30
```

```
        XROM "MASSFLO"
RUN NUMBER
B3 R3 18 JULY
                    RUN

VOL MTR STD ?
         54.224     RUN
STACK DSCFM ?
        41 810.00   RUN
FRONT 1/2 MG ?
          1.033.20  RUN
BACK 1-2 MG ?
            0.00    RUN


F  GR/DSCF = 0.29
F  MG/MMM = 672.86
F  LB/HR = 105.79
F  KG/HR = 47.96
```

BOILER 3, 19 JULY

```
*          XROM "METH 5"
RUN NUMBER
B3 R1 19 JULY
                         RUN
METER BOX Y?
          1.0770         RUN
DELTA H?
          3.3700         RUN
BAR PRESS ?
         29.6200         RUN
METER VOL ?
         52.2720         RUN
MTR TEMP F?
        109.0000         RUN
% OTHER GAS
REMOVED BEFORE
DRY GAS METER ?
                         RUN
STATIC H2O IN ?
         -1.0500         RUN
STACK TEMP.
        379.0000         RUN
ML. WATER ?
        101.3000         RUN
IMP. % H2O = 6.5

% H2O=6.5


% CO2?
          8.5000         RUN
% OXYGEN?
         10.9000         RUN
% CO ?
                         RUN
MOL WT OTHER?
                         RUN


MWd =29.89
MW WET=28.89


SQRT PSTS ?
         31.1697         RUN
TIME MIN ?
         60.0000         RUN
NOZZLE DIA ?
           .2500         RUN
STK DIA INCH ?
         52.5000         RUN

* VOL MTR STD = 52.167
  STK PRES ABS = 29.55
  VOL H2O GAS = 4.91
  % MOISTURE = 8.45
  MOL DRY GAS = 0.915
  % NITROGEN = 80.69
  MOL WT DRY = 29.89
  MOL WT WET = 28.89
  VELOCITY FPS = 79.72
  STACK AREA = 15.0
  STACK ACFM = 69.094
* STACK DSCFM = 39.333
  % ISOKINETIC = 97.57
```

```
          XROM "MASSFLO"
RUN NUMBER
B3 R1 19 JULY
                         RUN

VOL MTR STD ?
         52.1630         RUN
STACK DSCFM ?
     39,333.0000         RUN
FRONT 1/2 MG ?
         345.1000        RUN
BACK 1/2 MG ?
                         RUN


F  GR/DSCF = 0.1011
F  MG/MMF = 233.6304
F  LB/HF = 34.4197
F  KG/HF = 15.6128
```

```
          XROM "MASSFLO"
RUN NUMBER
B3 R2 19 JULY
                         RUN

VOL MTR STD ?
         51.9060         RUN
STACK DSCFM ?
     41,337.0000         RUN
FRONT 1/2 MG ?
         760.0000        RUN
BACK 1/2 MG ?
                         RUN


F  GR/DSCF = 0.2264
F  MG/MMF = 517.0434
F  LB/HF = 80.0513
F  KG/HF = 36.3111
```

```
          XROM "METH 5"
RUN NUMBER
B3 R2 19 JULY
                         RUN
METER BOX Y?
          1.0770         RUN
DELTA H?
          3.6000         RUN
BAR PRESS ?
         29.6280         RUN
METER VOL ?
         52.2590         RUN
MTR TEMP F?
        112.0000         RUN
% OTHER GAS
REMOVED BEFORE
                         RUN
DRY GAS METER ?
                         RUN
STATIC H2O IN ?
         -1.0500         RUN
STACK TEMP.
        379.0000         RUN
ML. WATER ?
         87.9000         RUN
IMP. % H2O = 7.4

% H2O=7.4


% CO2?
          9.5000         RUN
% OXYGEN?
          9.9000         RUN
% CO ?
                         RUN
MOL WT OTHER?
                         RUN


MWd =29.91
MW WET=29.04


SQRT PSTS ?
         32.4700         RUN
TIME MIN ?
         60.0000         RUN
NOZZLE DIA ?
           .2500         RUN
STK DIA INCH ?
         52.5000         RUN

* VOL MTR STD = 51.906
  STK PRES ABS = 29.55
  VOL H2O GAS = 4.14
  % MOISTURE = 7.38
  MOL DRY GAS = 0.926
  % NITROGEN = 80.69
  MOL WT DRY = 29.91
  MOL WT WET = 29.04
  VELOCITY FPS = 79.66
  STACK AREA = 15.07
  STACK ACFM = 71.891
* STACK DSCFM = 41.337
  % ISOKINETIC = 92.75
```

```
          XROM "METH 5"
RUN NUMBER
B3 R3 19 JULY
                         RUN
METER BOX Y?
          1.0770         RUN
DELTA H?
          3.4100         RUN
BAR PRESS ?
         29.6280         RUN
METER VOL ?
         52.4960         RUN
MTR TEMP F?
        108.0000         RUN
% OTHER GAS
REMOVED BEFORE
DRY GAS METER ?
                         RUN
STATIC H2O IN ?
         -1.0500         RUN
STACK TEMP.
        378.0000         RUN
ML. WATER ?
        107.6000         RUN
IMP. % H2O = 8.8

% H2O=8.8


% CO2?
          7.3000         RUN
% OXYGEN?
         12.3000         RUN
% CO ?
                         RUN
MOL WT OTHER?
                         RUN


MWd =29.65
MW WET=28.67


SQRT PSTS ?
         31.4201         RUN
TIME MIN ?
         60.0000         RUN
NOZZLE DIA ?
           .2500         RUN
STK DIA INCH ?
         52.5000         RUN

* VOL MTR STD = 50.454
  STK PRES ABS = 29.55
  VOL H2O GAS = 5.66
  % MOISTURE = 8.99
  MOL DRY GAS = 0.910
  % NITROGEN = 80.49
  MOL WT DRY = 29.65
  MOL WT WET = 28.67
  VELOCITY FPS = 77.57
  STACK AREA = 15.03
  STACK ACFM = 69.964
* STACK DSCFM = 39.787
  % ISOKINETIC = 97.21
```

```
          XROM "MASSFLO"
RUN NUMBER
B3 R3 19 JULY
                         RUN

VOL MTR STD ?
         50.4840         RUN
STACK DSCFM ?
     39,787.0000         RUN
FRONT 1/2 MG ?
         381.1000        RUN
BACK 1/2 MG ?
                         RUN


F  GR/DSCF = 0.1121
F  MG/MMF = 256.4141
F  LB/HF = 38.1379
F  KG/HF = 17.2994
```

BOILER 3, 20 JULY

```
          XROM "METH 5"
RUN NUMBER
B3 R1 20 JULY
                        RUN
METER BOX Y?
          1.0770        RUN
DELTA H?
          3.1900        RUN
BAR PRESS ?
         29.2450        RUN
METER VOL ?
         49.8000        RUN
MTR TEMP F?
        104.0000        RUN
% OTHER GAS
REMOVED BEFORE
DRY GAS METER ?
                        RUN
STATIC H2O IN ?
         -1.1000        RUN
STACK TEMP.
        373.0000        RUN
ML. WATER ?
        117.9000        RUN
IMP. % H2O = 10.1

% H2O=10.1


% CO2
          9.7000        RUN
% OXYGEN
          9.3000        RUN
% CO ?
                        RUN
MOL WT OTHER
                        RUN

MWd =29.92
MW WET=28.72


SQRT PSTS ?
         30.4430        RUN
TIME MIN ?
         60.0000        RUN
NOZZLE DIA ?
           .2500        RUN
STK DIA INCH ?
         52.5000        RUN

* VOL MTR STD = 49.491
  STK PRES ABS = 29.14
  VOL H2O GAS = 5.55
  % MOISTURE = 10.0
  MOL DRY GAS = 0.999
  % NITROGEN = 81.0
  MOL WT DRY = 29.92
  MOL WT WET = 28.72
  VELOCITY FPS = 75.54
  STACK AREA = 15.03
  STACK ACFM = 68 130.
* STACK DSCFM = 37 850.
  % ISOKINETIC = 96.14
```

```
          XROM "MASSFLO"
RUN NUMBER
B3 R1 20 JULY
                        RUN
VOL MTR STD ?
          49.491        RUN
STACK DSCFM ?
         37.856.000     RUN
FRONT 1 2 MG ?
         359.400        RUN
BACK 1/2 MG ?
           0.000        RUN


F  GR/DSCF = 0.113
F  MG/MMM = 256.490
F  LB/HR = 38.365
F  KG/HR = 16.495
```

```
          XROM "MASSFLO"
RUN NUMBER
B3 R1 20 JULY
                        RUN
VOL MTR STD ?
          50.154        RUN
STACK DSCFM ?
         37.594.000     RUN
FRONT 1 2 MG ?
         287.400        RUN
BACK 1 2 MG ?
           0.000        RUN


F  GR/DSCF = 0.087
F  MG/MMM = 199.545
F  LB/HR = 28.181
F  KG/HR = 12.784
```

```
          XROM "METH 5"
RUN NUMBER
B3 R2 20 JULY
                        RUN
METER BOX Y?
          1.0770        RUN
DELTA H?
          3.1300        RUN
BAR PRESS ?
         29.2380        RUN
METER VOL ?
         50.7750        RUN
MTR TEMP F?
        107.0000        RUN
% OTHER GAS
REMOVED BEFORE
DRY GAS METER ?
                        RUN
STATIC H2O IN ?
         -1.1000        RUN
STACK TEMP.
        373.0000        RUN
ML. WATER ?
        115.6000        RUN
IMP. % H2O = 9.8

% H2O=9.8


% CO2
         10.3000        RUN
% OXYGEN
          8.9000        RUN
% CO ?
                        RUN
MOL WT OTHER
                        RUN

MWd =30.00
MW WET=28.87


SQRT PSTS ?
         30.1990        RUN
TIME MIN ?
         60.0000        RUN
NOZZLE DIA ?
           .2500        RUN
STK DIA INCH ?
         52.5000        RUN

* VOL MTR STD = 50.154
  STK PRES ABS = 29.14
  VOL H2O GAS = 5.44
  % MOISTURE = 9.79
  MOL DRY GAS = 0.902
  % NITROGEN = 80.8
  MOL WT DRY = 30.00
  MOL WT WET = 28.87
  VELOCITY FPS = 74.88
  STACK AREA = 15.03
  STACK ACFM = 67.459.
* STACK DSCFM = 37 594.
  % ISOKINETIC = 96.11
```

```
          XROM "METH 5"
RUN NUMBER
B3 R3 20 JULY
                        RUN
METER BOX Y?
          1.0770        RUN
DELTA H?
          3.1900        RUN
BAR PRESS ?
         29.2380        RUN
METER VOL ?
         51.2550        RUN
MTR TEMP F?
        110.0000        RUN
% OTHER GAS
REMOVED BEFORE
DRY GAS METER ?
                        RUN
STATIC H2O IN ?
         -1.1000        RUN
STACK TEMP.
        372.0000        RUN
ML. WATER ?
        114.6000        RUN
IMP. % H2O = 9.7

% H2O=9.7


% CO2
         10.3000        RUN
% OXYGEN
          9.3000        RUN
% CO ?
                        RUN
MOL WT OTHER
                        RUN

MWd =30.02
MW WET=28.89


SQRT PSTS ?
         30.4122        RUN
TIME MIN ?
         60.0000        RUN
NOZZLE DIA ?
           .2500        RUN
STK DIA INCH ?
         52.5000        RUN

* VOL MTR STD = 50.354
  STK PRES ABS = 29.15
  VOL H2O GAS = 5.29
  % MOISTURE = 9.49
  MOL DRY GAS = 0.905
  % NITROGEN = 80.4
  MOL WT DRY = 30.02
  MOL WT WET = 28.89
  VELOCITY FPS = 75.36
  STACK AREA = 15.03
  STACK ACFM = 67 921.
* STACK DSCFM = 37 930.
  % ISOKINETIC = 97.64
```

```
          XROM "MASSFLO"
RUN NUMBER
B3 R3 20 JULY
                        RUN
VOL MTR STD ?
          50.354        RUN
STACK DSCFM ?
         37.930.000     RUN
FRONT 1 2 MG ?
         430.500        RUN
BACK 1/2 MG ?
           0.000        RUN


F  GR/DSCF = 0.123
F  MG/MMM = 281.944
F  LB/HR = 40.897
F  KG/HR = 18.454
```

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APPENDIX K

Calibration Data

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METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 12 Jul 88 Meter box number 2010 NUTECH

Barometric pressure, P_b = 29.119 in. Hg Calibrated by Fagin & Scott

Val in ⁴	Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F/R	Temperature: Dry gas meter: Inlet (t_{d_i}), °F/R	Temperature: Dry gas meter: Outlet (t_{d_o}), °F/R	Temperature: Dry gas meter: Avg[a] (t_d), °F/R	Time (θ), min	Y_i	$\Delta H@_i$ in. H_2O
4	0.5	5	4.668	78 79 538	76 83 539.5	75 78 536.5	538	13.1	1.070	2.010
4	1.0	5	4.670	78 78 538	89 89 546.5	78 81 539.5	543	9.3	1.078	2.008
4	1.5	10	9.390	78 78 538	90 96 553	82 86 544	548.5	15.5	1.082	2.070
4	2.0	10	9.455	79 80 539.5	96 101 558.5	87 90 548.5	553.5	13.5	1.070	2.087
4	3.0	10	9.470	80 81 540.5	101 106 563.5	90 93 551.5	557.5	11.1	1.081	2.109
4	4.0	10.1	9.590	81 81 541	106 109 567.5	94 96 555	561.3	9.8	1.082	2.138
								Avg	1.077	2.070

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H@_i = \frac{0.0317\ \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\ \theta}{V_w}\right]^2$
0.5	0.0368	$Y_1 = \frac{(5)(29.119)(538)}{(4.668)(29.119 + \frac{0.5}{13.6})(538)}$	$\Delta H@_1 = \frac{(.0317)(.5)}{(29.119)(538)} \left[\frac{(538)(13.1)}{5}\right]^2$
1.0	0.0737	$Y_2 = \frac{(5)(29.119)(543)}{(4.67)(29.119 + 1/13.6)(538)}$	$\Delta H@_2 = \frac{(.0317)(1)}{(29.119)(543)} \left[\frac{(538)(9.3)}{5}\right]^2$
1.5	0.110	$Y_3 = \frac{(10)(29.119)(548.5)}{(9.39)(29.119 + 1.5/13.6)(538)}$	$\Delta H@_3 = \frac{(.0317)(1.5)}{(29.119)(548.5)} \left[\frac{(538)(15.5)}{10}\right]^2$
2.0	0.147	$Y_4 = \frac{(10)(29.119)(553.5)}{(9.455)(29.119 + 2/13.6)(538.5)}$	$\Delta H@_4 = \frac{(.0317)(2.0)}{(29.119)(553.5)} \left[\frac{(539.5)(13.5)}{10}\right]^2$
3.0	0.221	$Y_5 = \frac{(10)(29.119)(557.5)}{(9.47)(29.119 + 3/13.6)(540.5)}$	$\Delta H@_5 = \frac{(.0317)(3)}{(29.119)(557.5)} \left[\frac{(540.5)(11.1)}{10}\right]^2$
4.0	0.294	$Y_6 = \frac{(10.1)(29.119)(561.3)}{(9.59)(29.119 + 4/13.6)(541)}$	$\Delta H@_6 = \frac{(.0317)(4)}{(29.119)(561.3)} \left[\frac{(541)(9.8)}{10.1}\right]^2$

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

Quality Assurance Handbook M4-2.3A (front side)

POSITEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number [illegible] Date 9 Aug 88 Meter box number _____ Plant Elkem Rock (Shaw) AFB

Barometric pressure, P_b = 29.76 in. Hg Dry gas meter number NUTECH Pretest Y 1.077

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$\frac{Y_i V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
2.0	10	9.327	79 79 534	84 86 545	79 80 531.5	542.25	12.2	-20.0	1.072	(10)(29.76)(542.25) / (9.327)(29.76+2.5/13.6)(539)
2.5	10	9.336	79 539	86 88 547	80 82 541	544.0	12.2	-20.0	1.074	(10)(29.76)(544) / (9.336)(29.76+2.5/13.6)(539)
2.5	10	9.368	81 86 547.9	85 87 549.5	82 84 543.0	546.25	12.2	-20.0	1.074	(10)(29.76)(546.25) / (9.368)(29.76+2.5/13.6)(539.5)
									Y = 1.073	

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

1.073 Y ± 0.05Y = 1.0232 → 1.1309

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ±0.05Y.

P_b = Barometric pressure, in. Hg.

Θ = Time of calibration run, min.

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 13 Jul 88 Meter box number PAC

Barometric pressure, P_b = 29.131 in. Hg Calibrated by Hagan & Scott

Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °R	Temperature: Dry gas meter: Inlet (t_{d_i}), °R	Temperature: Dry gas meter: Outlet (t_{d_o}), °R	Temperature: Dry gas meter: Avg[a] (t_d), °R	Time (θ), min	Y_i	$\Delta H@_i$ in. H_2O
0.5	5	4.712	78 77 537.5	94 101 557.5	76 79 537	548.25	12.0	1.081	1.652
1.0	5.2	4.940	77 78 537.5	104 109 566.5	78 80 539	552.75	8.9	1.080	1.666
1.5	10	9.600	78 78 538	111 113 572	81 84 542.5	557.25	15.0	1.075	1.908
2.0	10	9.529	78 79 538.5	115 116 575.5	85 86 545.5	560.5	13.0	1.087	1.902
3.0	10	9.636	77 79 539	117 120 578.5	87 88 547.5	563.0	10.6	1.076	1.893
4.0	10	9.605	79 79 539	120 122 581	86 89 548.5	564.75	9.1	1.080	1.391
							Avg	1.080	1.736

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	$\Delta H@_i = \frac{0.0317\ \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\ \theta}{V_w}\right]^2$
0.5	0.0368	$Y_1 = \frac{(5)(29.131)(548.25)}{(4.712)(29.131 + 0.5/13.6)(537.5)}$	$\Delta H@_1 = \frac{(0.0317)(0.5)}{(29.131)(548.25)} \left[\frac{(537.5)(12.0)}{5}\right]^2$
1.0	0.0737	$Y_2 = \frac{(5.2)(29.131)(552.75)}{(4.94)(29.131 + 1.0/13.6)(537.5)}$	$\Delta H@_2 = \frac{(0.0317)(1)}{(29.131)(552.75)} \left[\frac{(537.5)(8.9)}{5.2}\right]^2$
1.5	0.110	$Y_3 = \frac{(10)(29.131)(557.25)}{(9.600)(29.131 + 1.5/13.6)(538)}$	$\Delta H@_3 = \frac{(0.0317)(1.5)}{(29.131)(557.25)} \left[\frac{(538)(15)}{10}\right]^2$
2.0	0.147	$Y_4 = \frac{(10)(29.131)(560.5)}{(9.529)(29.131 + 2.0/13.6)(538.5)}$	$\Delta H@_4 = \frac{(0.0317)(2)}{(29.131)(560.5)} \left[\frac{(538.5)(13)}{10}\right]^2$
3.0	0.221	$Y_5 = \frac{(10)(29.131)(563.0)}{(9.636)(29.131 + 3/13.6)(539)}$	$\Delta H@_5 = \frac{(0.0317)(3)}{(29.131)(563.0)} \left[\frac{(539)(10.6)}{10}\right]^2$
4.0	0.294	$Y_6 = \frac{(10)(29.131)(564.75)}{(9.605)(29.131 + 4/13.6)(539)}$	$\Delta H@_6 = \frac{(0.0317)(4)}{(29.131)(564.75)} \left[\frac{(539)(9.1)}{10}\right]^2$

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

Quality Assurance Handbook M4-2.3A (front side)

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units) Inlet (Pre) Outlet (Pre)

Test number #1 Date 9 Aug 88 Meter box number _____ Plant _____

Barometric pressure, P_b = 29.76 in. Hg Dry gas meter number RAC Pretest Y 1.080

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F/°R	Temperature: Dry gas meter: Inlet (t_{d_i}), °F/°R	Temperature: Dry gas meter: Outlet (t_{d_o}), °F/°R	Temperature: Dry gas meter: Average[a] (t_d), °F/°R	Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i = $\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
2.5	10	9.481	81 82 540 5	111 134 582.5	76 83 539 5	561.5	11.44	20 Ø	1.097	(10)(29.76)(561) / (9.481)(29.76+2.5/13.6)(540.5)
2.5	10	9.516	80 81 540 5	134 141 587 5	83 88 545 5	571.5	11.47	20 Ø	1.104	(10)(29.76)(571.5) / (9.516)(29.76+2.5/13.6)(540.5)
2.5	10	9.646	81 82 541 5	143 147 605	90 95 552 5	578.75	11.50	20 Ø	1.101	(10)(29.76)(578.75) / (9.646)(29.76+2.5/13.6)(541.5)
									Y = 1.101	

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

V_w = Gas volume passing through the wet test meter, ft^3

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ±0.05Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

NEW Y CHANGE = PRETEST Y ± Y

= 1.026 → 1.134

APPENDIX L

EPA Method 9 Certification Documentation

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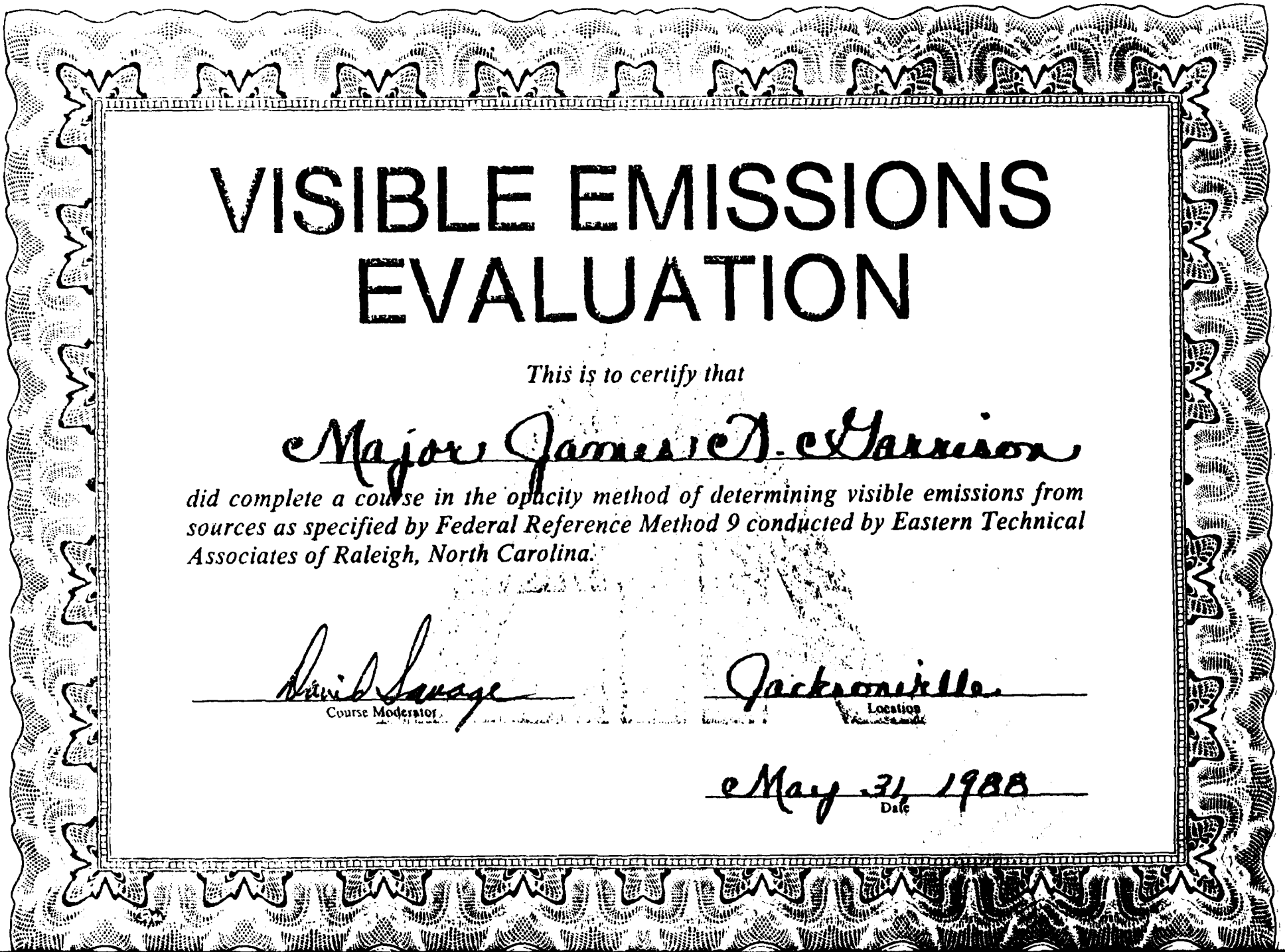

VISIBLE EMISSIONS EVALUATION

This is to certify that

Major James D. Garrison

did complete a course in the opacity method of determining visible emissions from sources as specified by Federal Reference Method 9 conducted by Eastern Technical Associates of Raleigh, North Carolina.

David Savage
Course Moderator

Jacksonville
Location

May 31 1988
Date

VISIBLE EMISSIONS EVALUATOR

This is to certify that

Major James A Harrison

met the specifications of Federal Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, North Carolina. This certificate is valid for six months from date of issue.

Thomas H. Rose
President

120573
Certificate Number

Willie S Lee
Vice President

Jacksonville
Location

David Savage
Program Manager

June 2 1988
Date of Issue

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